Safe, fast and ever increasing passenger service is essential to all out war effort.

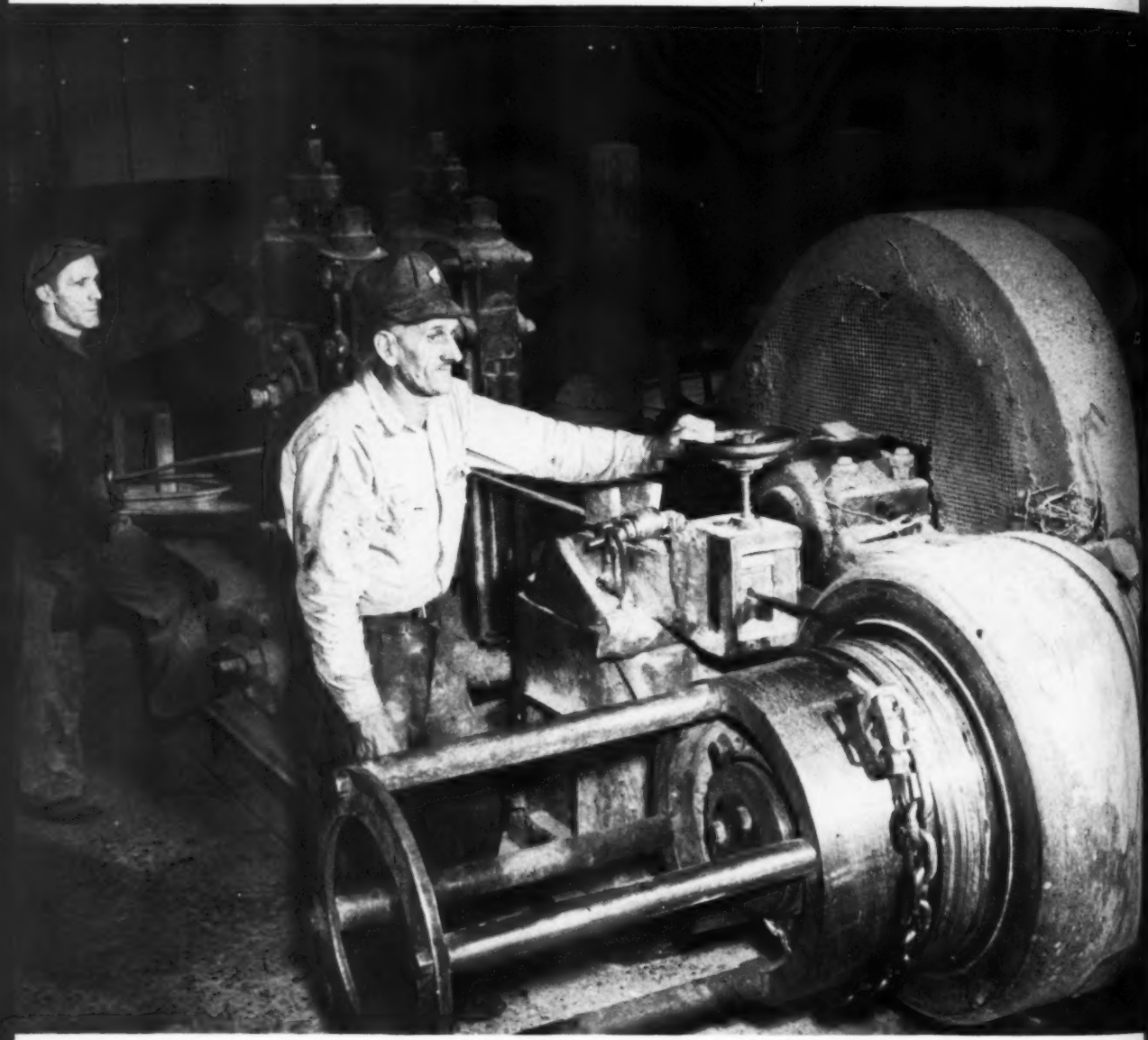
1918	THE RECORD	1943
1,123,000,000	Revenue Passengers	891,790,000
43,212,458,000	Revenue Passenger Miles	87,974,200,000*

**with less labor, equipment and materials*

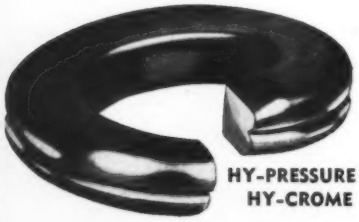
Railroad management and labor, with best materials, inspection and service, combine to make this record possible.

Reliance HY-CROME Spring Washers

In The Draft – HY-CROME



"Edgemark of Quality"



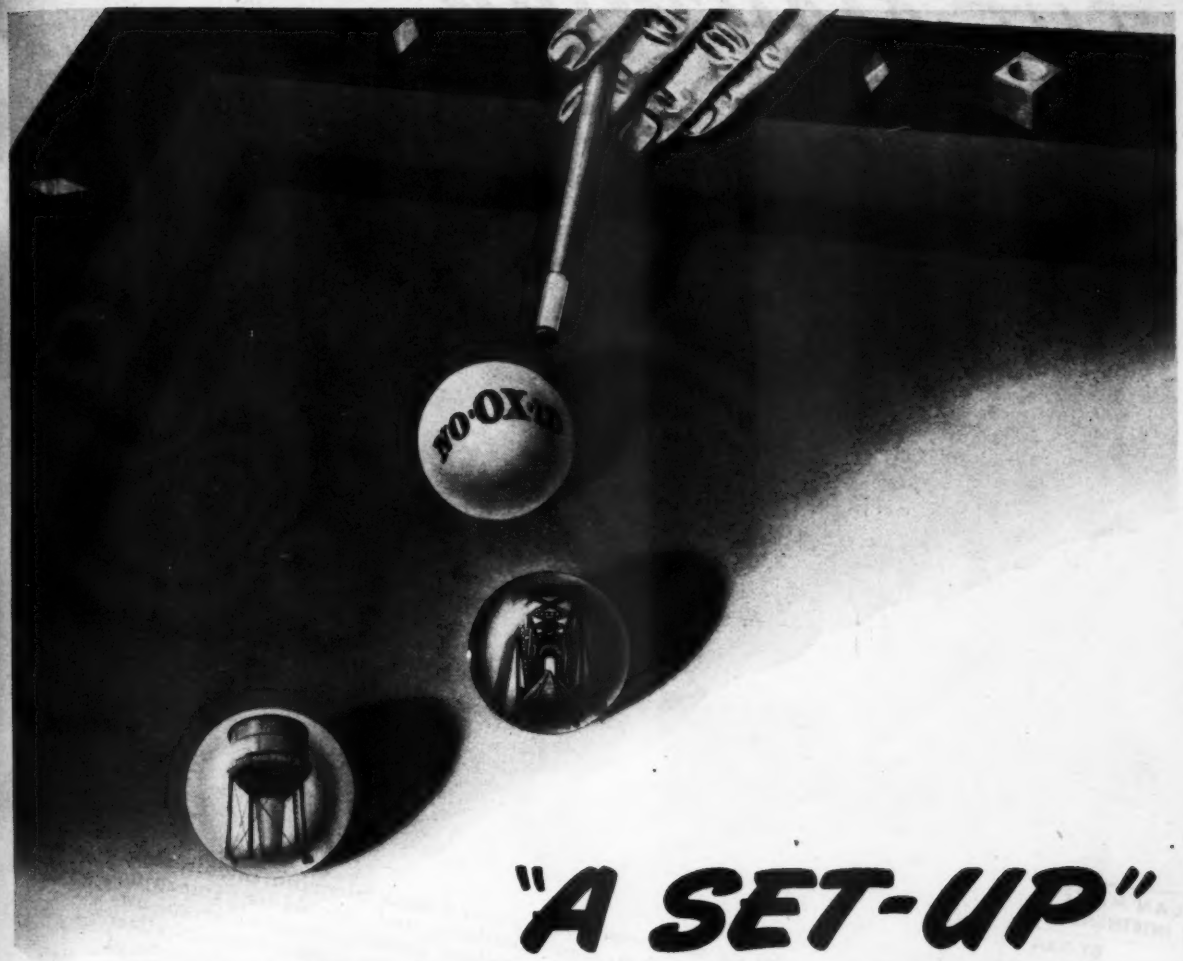
HY-PRESSURE
HY-CROME

● Cold drawn steel for **HY-CROME Spring Washers** is carefully controlled as to analysis, draft, annealing and design of section. Every step in its preparation for fabrication into **HY-CROME Spring Washers** is carefully supervised and planned. Control of raw material definitely contributes to the producing of a superior quality product.

● **HY-CROME Spring Washers** are made with various design of steel sections and each bolt size rightfully has the correct graduation in size, for specific applications, tested and produced to provide maximum in serviceability. **HY-CROME** has answered the war draft from steel to finished product. Send for descriptive Railway Spring Washer Track Folder.

EATON MANUFACTURING CO. RELIANCE SPRING WASHER DIVISION, MASSILLON, OHIO

Sales Offices: New York • Cleveland • Detroit • Chicago • St. Louis • San Francisco • Montreal



"A SET-UP" for Maintenance Crews

Protection of your equipment and structures against rust can't miss with a set-up like this... much more so now that you are operating short-handed.

Arm your maintenance crews with NO-OX-ID and instructions to coat all metal structures where corrosion is active. Fifty per cent of operating time is saved because the coating can be applied directly... without expensive pre-cleaning to remove rust.

The action of NO-OX-ID is immediate and lasting. It stops loss of metal. Bridges and turntables are made impregnable to corrosion under the most severe conditions; rail joints become rust resistant and self-lubricating. Moisture and oxygen are excluded; corrosion inhibited.

NO-OX-ID has been used by railroads everywhere for over a quarter of a century. Our representatives will be glad to assist you with your rust-prevention problems.

DEARBORN CHEMICAL COMPANY
Dept. U, 310 S. Michigan Ave., Chicago 4, Illinois

The ORIGINAL RUST PREVENTIVE

Published monthly by Simmons Boardman Publishing Corporation, 105 W. Adams St., Chicago 3, Ill. Subscription price: United States and Possessions, and Canada, $2.00; Foreign, $3.00. Single copies 35 cents. Entered as second-class matter January 20, 1933, at the postoffice at Chicago, Ill., under the act of March 3, 1879, with additional entry at Mount Morris, Ill., postoffice. Address communications to 105 W. Adams St., Chicago 3, Ill.

THE RAILROAD MAINTENANCE-OF-WAY MANS DREAM!

YOU CAN MOVE YOUR NORTHWEST

BY RAIL

ON ITS OWN TRAILER

OR YOU CAN BUY IT TRUCK-MOUNTED

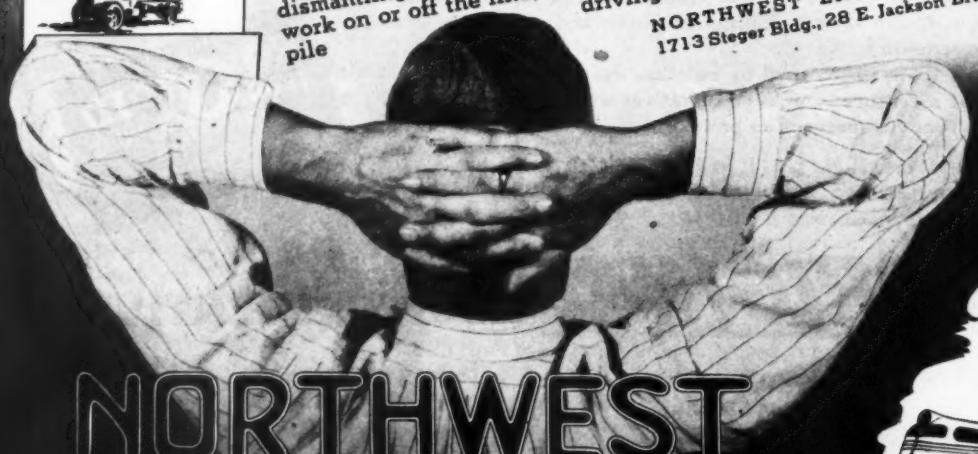
Loads itself under its own power on one flatcar or can be loaded on regular highway trailer. Travels through drop-end gondolas or from flatcar to flatcar. Works from gondola or flatcar. Handles clamshell, orange peel, tie and rail tongs, log grapple, sling, pile driver, steam hammer, pile puller, dragline, bucket and magnet, and it is convertible to a shovel or pullshovel by simply changing booms.

With a Northwest Crawler Crane you are equipped to handle rail laying or dismantling, bridge timbers, drainage work on or off the line, culvert work, driving or pulling, bank trimming, ditching and building out shoulders, spreading ballast, loading stores or scrap, unloading trucks or cars, digging ballast in the pit and do all the hundreds of digging and lifting jobs that are daily requirements in railway operation.

There is a Northwest of the right capacity for almost every problem and with Northwest comes many exclusive features that makes it faster and more productive on the job.

We'd like to tell you how many of the leading railways are using them and give you details on Northwest advantages.

NORTHWEST ENGINEERING COMPANY
1713 Steger Bldg., 28 E. Jackson Blvd., Chicago 4, Ill.



NORTHWEST

THE ALL PURPOSE RAILROAD MACHINE
SHOVEL • CRANE • DRAGLINE • PULLSHOVEL

PROVED on the nation's LEADING RAILROADS

10 YEARS

OF STREAMLINE RAILWAY OPERATION

Ten pounds of Spike Maul from Warren Tool's famous Devil Line—the Slug Devil Double Duty Pittsburgh (Bell) Pattern Spike Maul

A popular item is Warren Tool's Devil Line —and Cut Devil Slim Pattern Track Chisel

MAINTENANCE GANGS DEPEND UPON GOOD TOOLS

Warren Heavy Hand Tools always have been favorites with maintenance crews. Here's why: With the Flex-Toe Claw Bar, two men can pull as many spikes as three men can with ordinary claw bars. The Devil Line of chisels, mauls and sledges are made from the best grade of electric furnace alloy tool steels, hand forged and heat treated.

During war years, we have shipped more Devil Line Tools to our railroad customers than ever before, in addition to supplying the Armed Forces.

"When the first lightweight, streamlined passenger train was introduced ten years ago, maintenance men were forced suddenly and without warning to raise their thinking from maximum speeds of 60-65 miles per hour to 90-100 miles per hour. They found that irregularities in line and surface that heretofore were of little concern at the lower speeds suddenly became of major importance; they saw quickly that station, water and other facilities required extensive reconstruction to cut minutes from operating delays; they recast working procedures to eliminate slow orders and interference with trains; they have undertaken extensive programs of line reconstruction to flatten or eliminate curves and thereby make possible the raising or removal of speed restrictions; and, of paramount importance, they have found it necessary to so maintain their track and structures at all times as to offset completely the increased hazards that are inherent in higher speeds."

(Portion of an editorial from Railway Engineering & Maintenance)

WARREN TOOL CORP. • WARREN, OHIO

Uniform Bolt Tension

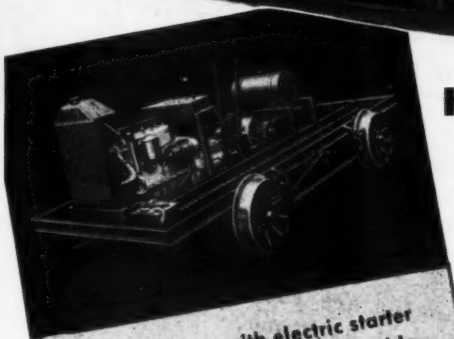
Verona *Fixed Tension* Triflex Spring

A calibrated leaf spring that gives adequate and uniform track bolt tension.

SINCE 1873

WOODINGS-VERONA TOOL WORKS, VERONA, PA.

SINCE 1873



40 H.P. motor with electric starter and generator . . . Adjustable brakes on four wheels . . . Body as a unit can be quickly removed from the strong, welded steel frame. For added traction four wheel drive can be furnished. Standard car, 14 man seating capacity—when equipped with side boards accommodates 28 men.

HEAVY DUTY
KALAMAZOO 38A

Rugged construction—Dependable Power . . . two sound reasons for the popularity of this heavy duty motor car. A compact unit, capable of long hard service. It provides tractor performance for a great variety of railroad jobs; gang car (28 man capacity with foot boards); carrying material as illustrated above; towing weed mowers, discers, welding equipment and air compressors. All power accessories, including starter, generator, ignition system, clutch and selective gear transmission are standard automotive products and are readily available. Shock absorbing spring axle bearing housings assure comfortable riding and longer life to the driving mechanism. In all a highly economical and dependable car that will help "Keep 'em Rolling."

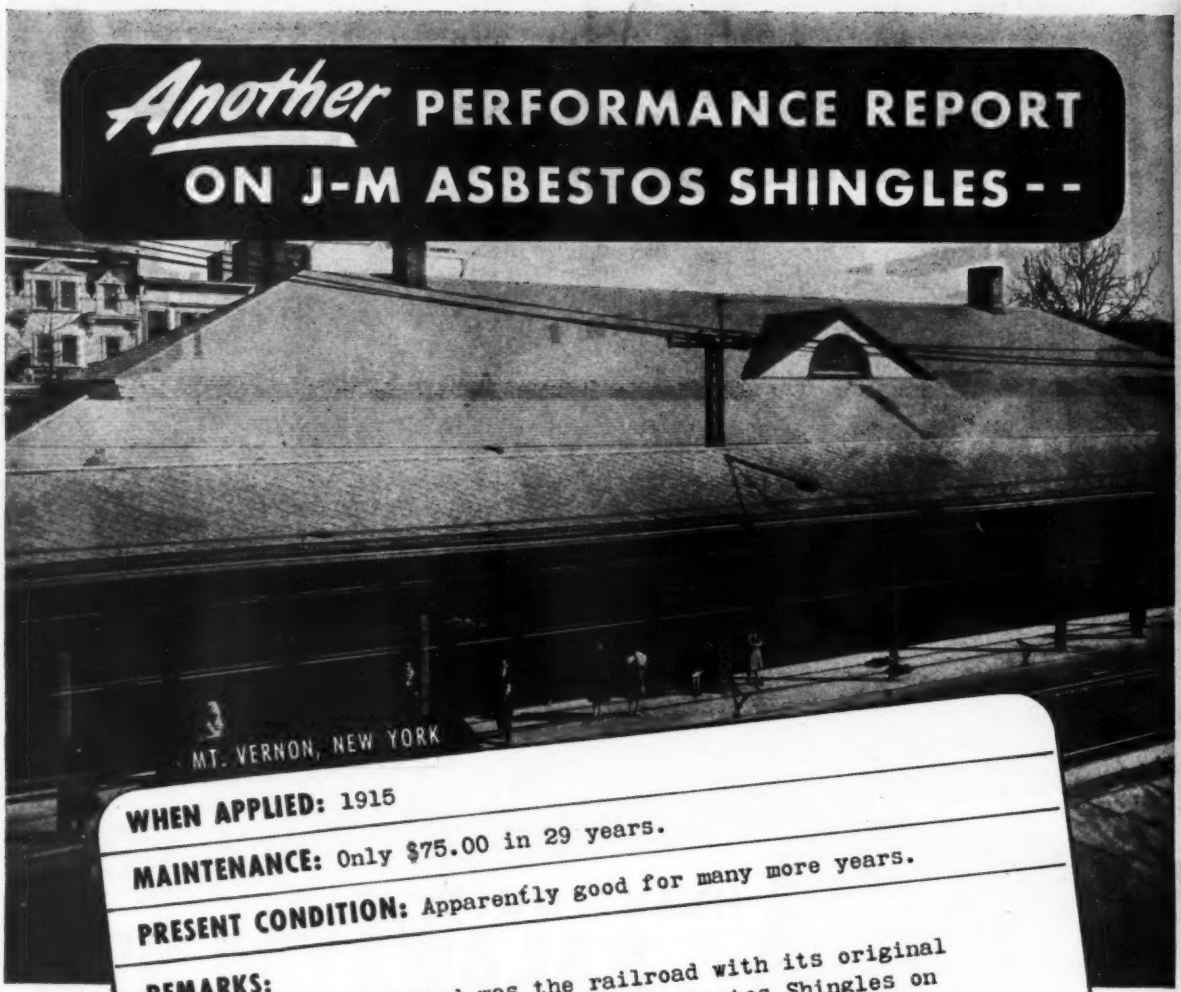
Bulletins on this and other Kalamazoo Products on request

KALAMAZOO MEANS SERVICE TO YOU

MANUFACTURING SINCE 1883

KALAMAZOO MANUFACTURING COMPANY
KALAMAZOO RAILWAY SUPPLY DIVISION
KALAMAZOO, MICH., U. S. A.

Another PERFORMANCE REPORT ON J-M ASBESTOS SHINGLES - -



MT. VERNON, NEW YORK

WHEN APPLIED: 1915

MAINTENANCE: Only $75.00 in 29 years.

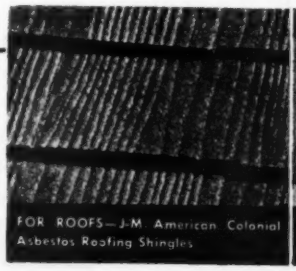
PRESENT CONDITION: Apparently good for many more years.

REMARKS:

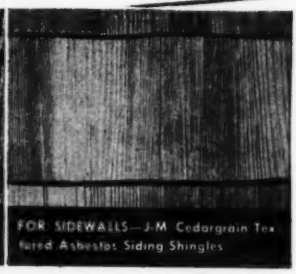
So well satisfied was the railroad with its original installation of Johns-Manville Asbestos Shingles on the roof of the station that, when they re-roofed the canopies over the platforms in 1928 they again specified this rugged roofing.

Made of asbestos and cement, J-M Shingles are rot-proof, weatherproof, fireproof, permanent as stone, and eliminate the need for preservative treatment.

Johns-Manville Asbestos Roofing Shingles and Siding Shingles are now available for permanent repairs and new installations where necessary. For complete details, write Johns-Manville at New York, Chicago, Cleveland, St. Louis or San Francisco.



FOR ROOFS—J-M American Colonial Asbestos Roofing Shingles



FOR SIDEWALLS—J-M Cedargrain Textured Asbestos Siding Shingles

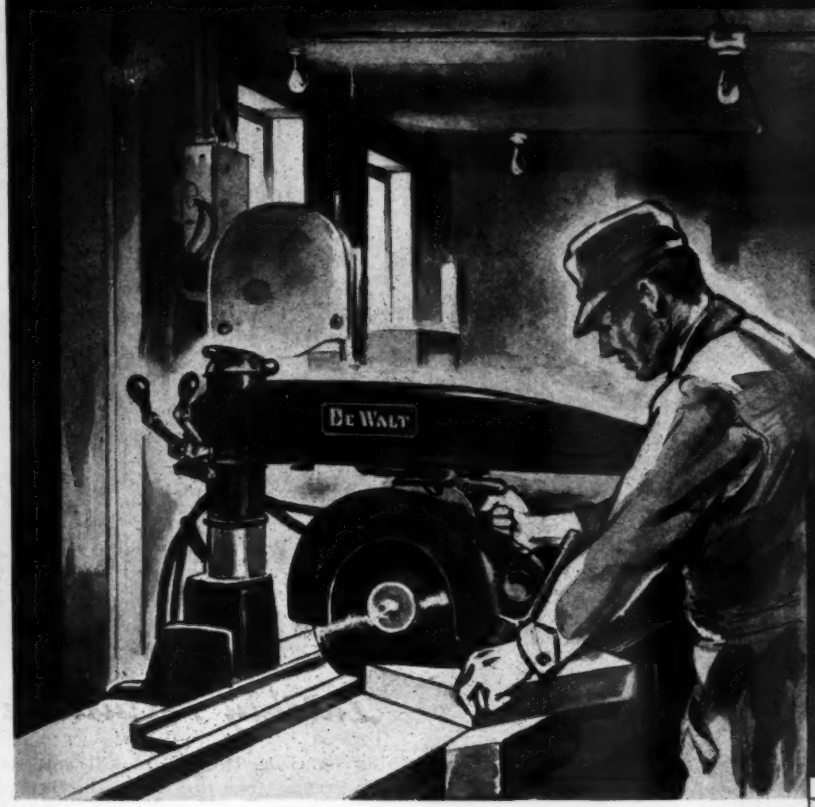
JOHNS-MANVILLE JM PRODUCTS

JOHNS-MANVILLE

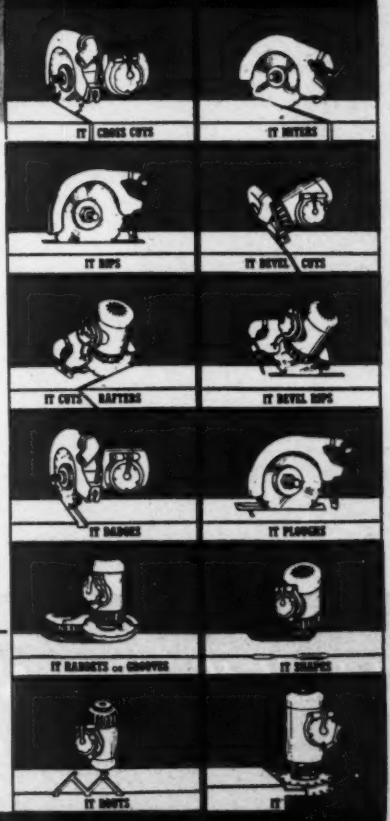
86 YEARS OF SERVICE TO TRANSPORTATION

Insulations • Packings • Friction Materials • Refractory Cements • Building Materials

MOBILE REPAIR SHOP
FOR MAINTENANCE OF WAY OPERATIONS!



Makes every cut possible with a circular saw.



Out of its war-time experiences in helping to solve manpower shortage and materials handling problems in transportation, DeWalt has developed new machines that make possible new methods of cutting wood.

DeWalt is the answer to your need for a safe, easy-to-operate adjustable cut-off saw. DeWalt also rips, dadoes, shapes and performs many other cutting operations.

DeWalt is portable. It can be easily installed in carpenter gang. tool cars or it can be moved from job to job on motor cars.

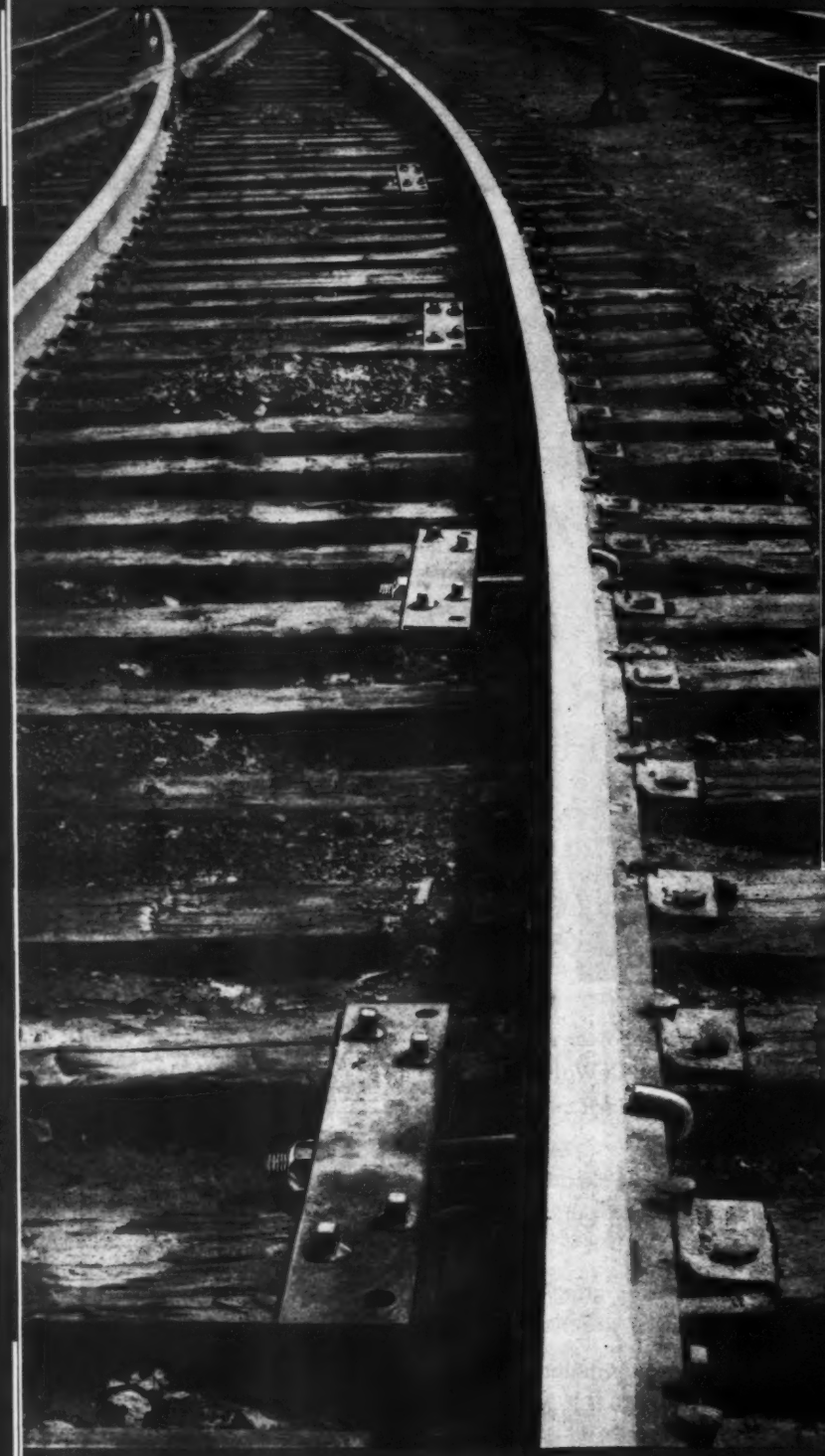
Investigate DeWalt. Cut cutting costs. Save labor. Simplify materials handling. DeWalt is available in models from ½ H.P. to 10 H.P. Mail coupon below for complete information.

DeWALT PRODUCTS CORPORATION
4905 Fountain Avenue, Lancaster, Penna.
Please send me information on the complete DeWalt line.

Name _____

Address _____

City _____ State _____



Quickly Adjustable

Morrison Gauge Holders are easily applied. I
screw-spikes, (two to a tie) secure it in pl
The holding rod, hooked over the rail flang
fastened to the plate with a grip nut, providin
adjustable feature for "take-up". *Morrison G*
Holders require no insulation on any track and
be applied to one or both rails as condi
warrant.

Get all the facts **AT ONCE**... *Cut Your maintenance co*

with these

MORRISON GAUGE HOLDERS

A REVOLUTIONARY IMPROVEMENT THAT GREATLY REDUCES TRACK MAINTENANCE COSTS

MAKES RAILS AND TIES "Stay-put"

The Morrison Gauge Holder is a SPECIALIST! It is engineered to do just one thing—keep rails in proper gauge under excessive pressure. Unlike the gauge rod ordinarily used for this purpose, the Morrison Gauge Holder transmits this pressure to screw-spikes which are not only independent of track fastenings, but are also firmly imbedded into the strongest, soundest part of the tie itself.

When ordinary gauge rods are used, track can be pulled out of alignment through pressure on one rail. With Morrison Gauge Holders the entire track structure would have to move in the ballast before any section of it could work out of alignment.

The design of Morrison Gauge Holders is based on sound engineering principles which make them low in first cost, easy to apply and lead to lower track maintenance costs and increased service life of the ties. On all curves, Morrison Gauge Holders are unsurpassed for safety and efficiency.

MORRISON
RAILWAY SUPPLY CORP.

EXECUTIVE OFFICES . . . BUFFALO 12, N. Y.
CHICAGO 4, ILL. BIRMINGHAM 3, ALA.

A LINK-BELT SPEEDER HANDLING CHILLED CAR WHEELS SOMEWHERE IN ENGLAND!

BUY MORE WAR BONDS!

Railroads everywhere are turning to these economical, easy-to-operate machines for all types of maintenance and conveying work. These machines can be shifted from one spot to another quickly and with a minimum of trouble. There is a machine to fill every need—with power, dash and dependability.

LINK-BELT SPEEDER

Builders of the Most Complete Line of
SHOVELS-CRANES-DRAGLINES

LINK-BELT SPEEDER CORPORATION, 301 W. PERSHING ROAD, CHICAGO 9, ILL.
A DIVISION OF LINK-BELT COMPANY

Here's a New, Easier, More Economical Way to Seal Car Windows

PRESSTITE

EXTRUDED GLASS SEALER TAPE

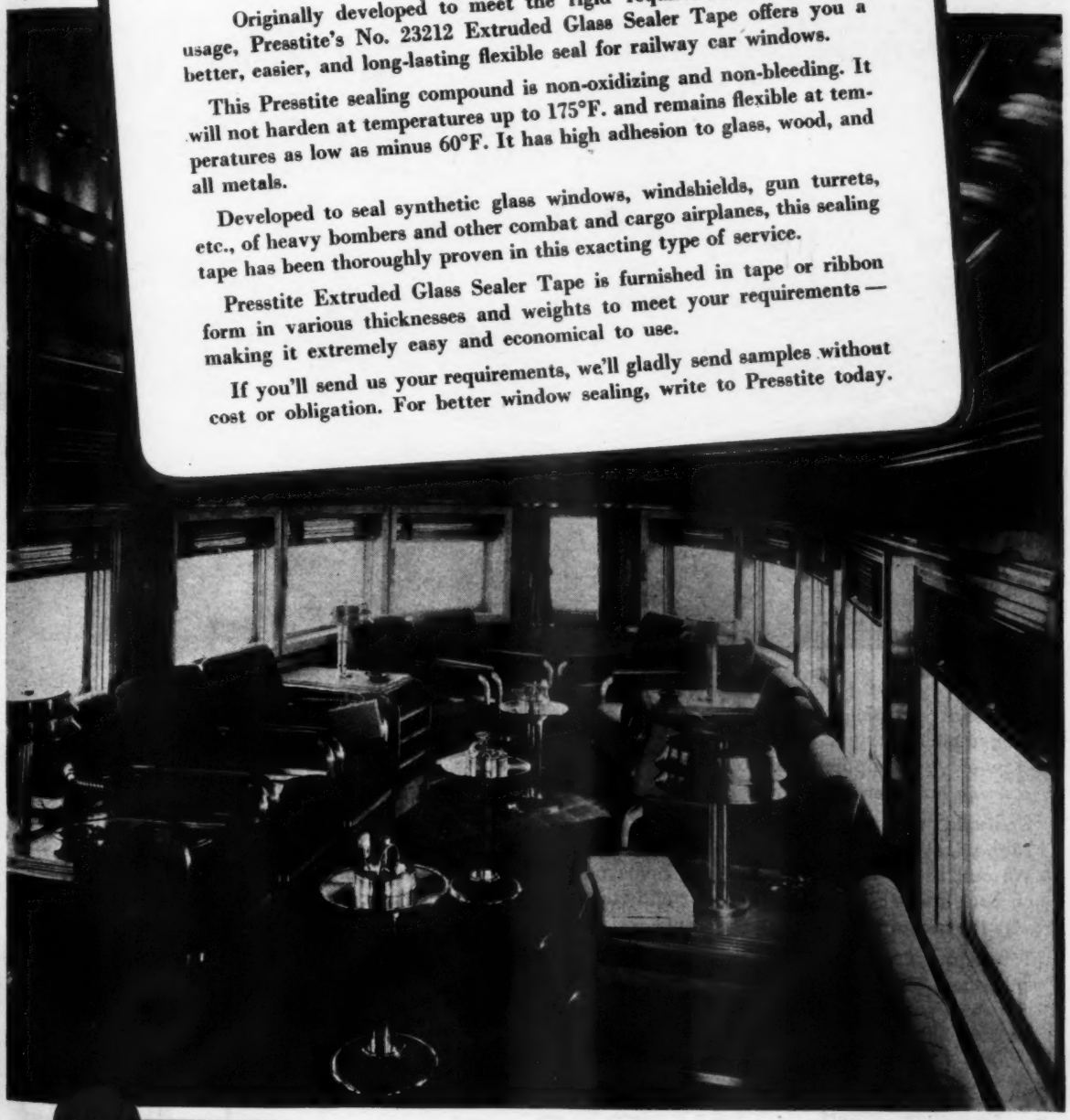
Originally developed to meet the rigid requirements of aviation usage, Presstite's No. 23212 Extruded Glass Sealer Tape offers you a better, easier, and long-lasting flexible seal for railway car windows.

This Presstite sealing compound is non-oxidizing and non-bleeding. It will not harden at temperatures up to 175°F. and remains flexible at temperatures as low as minus 60°F. It has high adhesion to glass, wood, and all metals.

Developed to seal synthetic glass windows, windshields, gun turrets, etc., of heavy bombers and other combat and cargo airplanes, this sealing tape has been thoroughly proven in this exacting type of service.

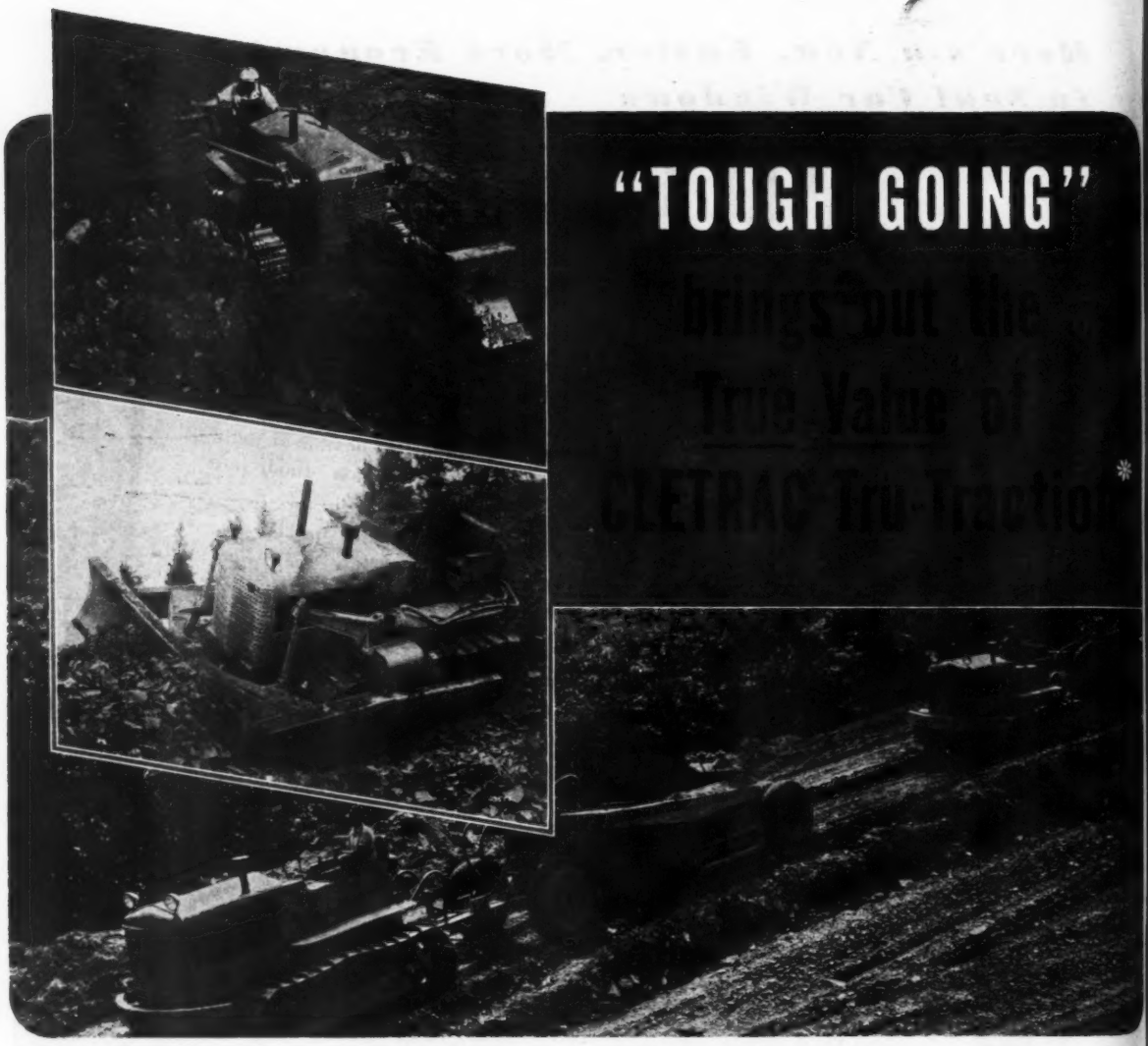
Presstite Extruded Glass Sealer Tape is furnished in tape or ribbon form in various thicknesses and weights to meet your requirements — making it extremely easy and economical to use.

If you'll send us your requirements, we'll gladly send samples without cost or obligation. For better window sealing, write to Presstite today.



PRESSTITE
SEALING COMPOUNDS

PRESSTITE ENGINEERING COMPANY
3964 Chouteau Avenue, St. Louis 10, Mo.



"TOUGH GOING" Brings Out the True Value of CLETRAC Tru-Traction*

IN soggy tropical jungles . . . in muck and mud of Alaska . . . on bottomless roads in Russia . . . on the rugged hills of Italy . . . the mighty power of military crawler type equipment with *controlled differential steering* has been proved again and again.

Controlled differential steering is, and has been for 25 years, an *exclusive* operating feature with Cletrac. We call it *Tru-Traction,* because it gives power on *both* tracks at *all* times, and the ability to steer with the tractor under full control—uphill and down.

Today, practically all high speed military crawler type equipment uses *controlled differential steering* which is exclusive with Cletrac in the crawler tractor field.

In civil activities as in military movements . . . in logging camps . . . in highway construction . . . in oil fields . . . for heavy hauling, bulldozing or earth moving, wherever the going is tough—Cletrac can be depended upon to do the job—and do it economically.

A substantial number of Cletracs are being released for essential civilian use—allocated according to government regulations. Your Cletrac dealer will gladly assist you in making application for a new Cletrac if you can qualify as an essential user.

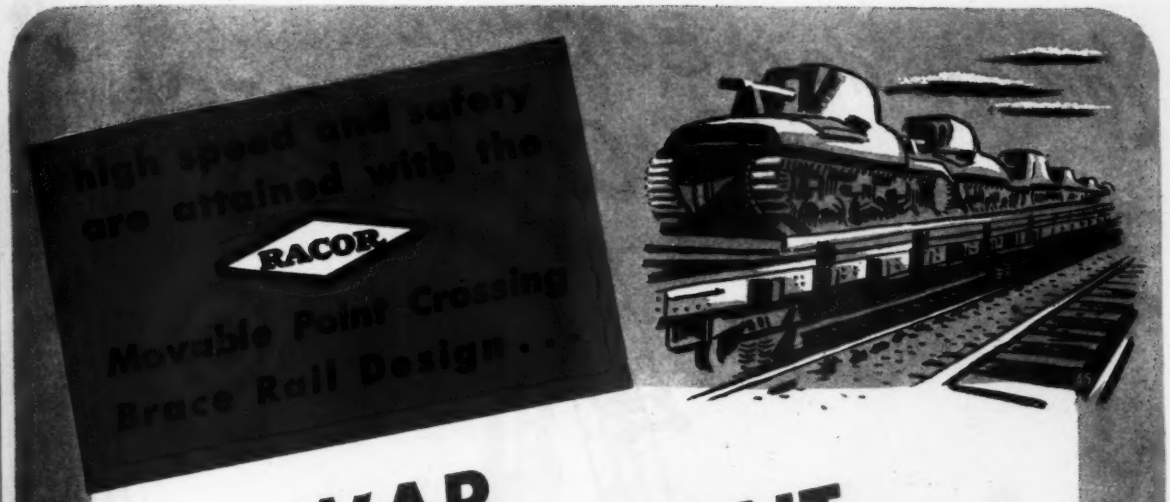
• • •

Illustrated at the right, below, is a folder recently published, telling of Cletrac's part in the war effort. A copy will be mailed on request.

*Tru-Traction is power on both tracks at all times

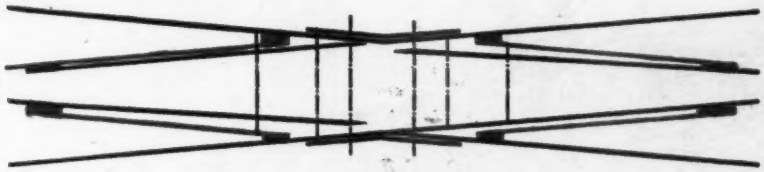
THE CLEVELAND TRACTOR COMPANY • CLEVELAND 17, OHIO

CLETRAC *Tru-Traction* TRACTORS



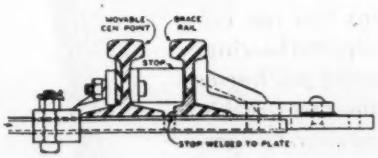
WAR can't WAIT

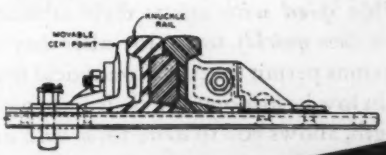
Men and materials are constantly moving over the railroads of the nation and the tracks are taking a terrible pounding. Long trains running day and night subject the flexible portions of the movable points to heavy shock. The Racor Movable Center Point Crossing Brace Rail is designed to help these points stand up under the pounding.



FEATURES OF THE RACOR MOVABLE POINT BRACE RAIL

1. The brace rails provide lateral support for the flexible portion of the movable points the same as provided by stock rails in ordinary switches.
2. Ties the entire crossing into one unit.
3. Renders other anti-creeper arrangements unnecessary.
4. Ruggedness of the structure guarantees economy by lower maintenance costs, especially at the heel joints.
5. Improved alignment and surface for movable center points permit high speed operation with safety.



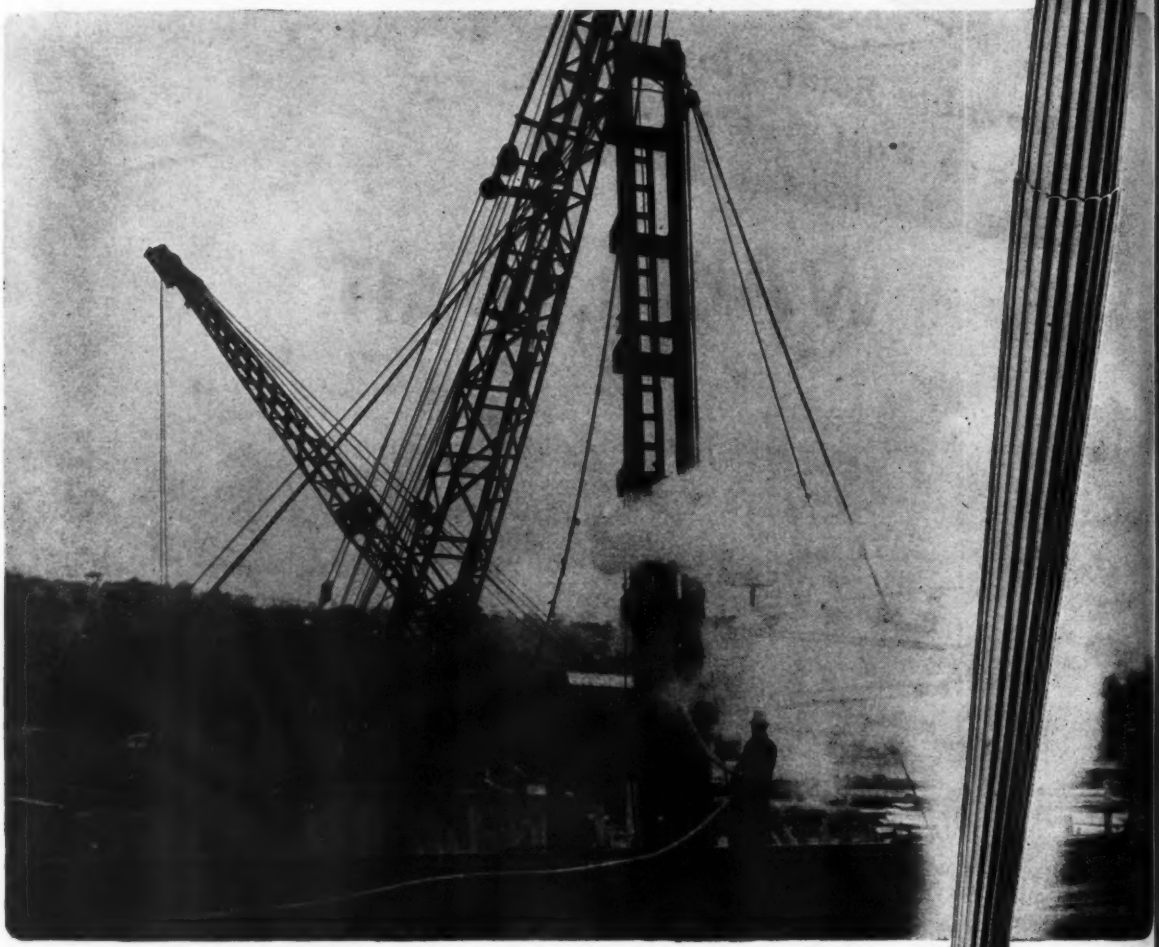


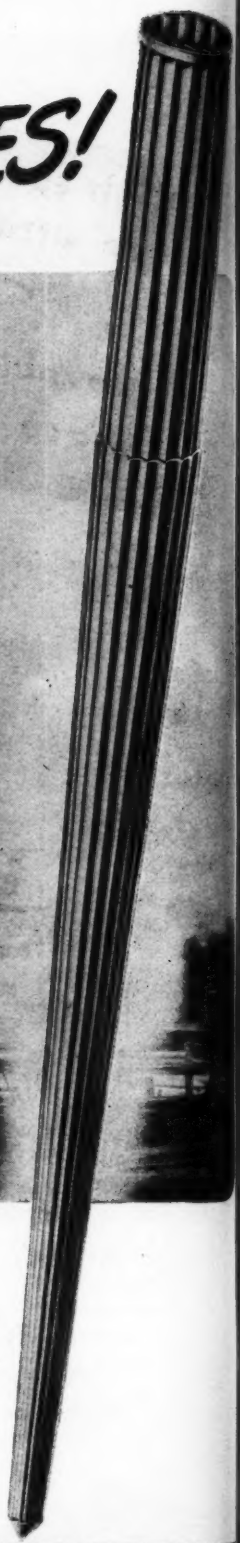
RAMAPO AJAX DIVISION
230 PARK AVENUE, NEW YORK

HILLBURN, N. Y.	EAST ST. LOUIS, ILL.	LOS ANGELES, CAL.
NIAGARA FALLS, N. Y.	PUEBLO, COLO.	SEATTLE, WASH.
CHICAGO, ILL.	SUPERIOR, WIS.	NIAGARA FALLS, ONTARIO

American Brake Shoe Company

You can do it Better ...with MONOTUBES!



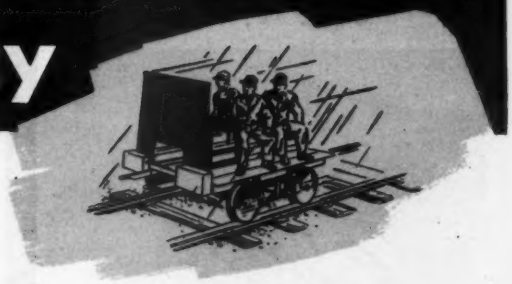


And here's why: Their tapered, fluted construction makes possible *speed with safety;* their tubular design means that you can *inspect them quickly,* top to toe, after they're driven to required bearing; extensions permit the fast, economical *installation of varying pile lengths* even in low headroom; and their light weight, despite their remarkable strength, allows you to *drive them with average job equipment.* Gauges, sizes, and tapers to meet all requirements. Write for your copy of Catalog 68A to the Union Metal Manufacturing Co., Canton 5, Ohio.

UNION METAL

Monotube Tapered Piles

Motor Cars That Meet the Emergency

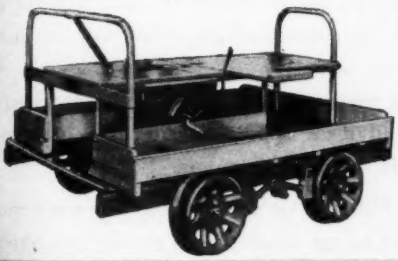


Fairbanks-Morse Motor Cars meet railroad wartime emergency needs for cars that stand up—that can take it 24 hours a day—in all kinds of weather—and under all conditions.

They are sturdy—reliable—powerful—safe

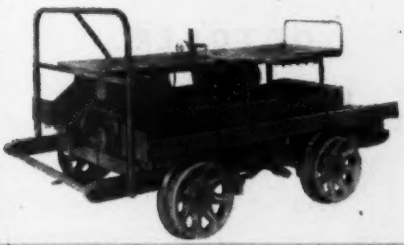
The complete line of Fairbanks-Morse-built Sheffield Motor Cars includes sizes ranging from one-man cars up to heavy-duty motor cars. Bulletins and complete information supplied upon request.

Fairbanks, Morse & Co., Fairbanks-Morse Building, Chicago 5, Illinois.

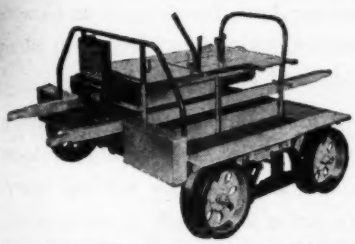


SHEFFIELD MODEL 44-B—The standard section car on many railroads. Sturdy, roomy. Weighs 1095 pounds. Has ample power to haul trailers loaded with men, tools or ties. Water-cooled 8- to 13-hp. engine with air-cooled head. Chain drive.

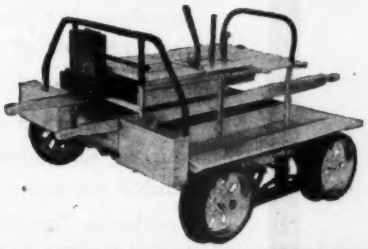
First on the Rails... and Still First



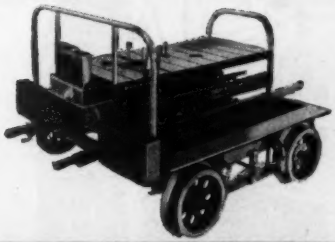
SHEFFIELD MODEL 40-B—One of the finest heavy-duty motor cars on rails. Has powerful engine—weighs 1235 pounds—ample room for section gangs. Has four speeds forward and reverse, with more than enough power to haul trailers.



NEW FAIRBANKS-MORSE VICTORY MODEL 57—The one-man inspection car, easily handled by one man alone. Has dependable 9-hp., water-cooled engine. Equipped with clutch and roller chain transmission.



NEW FAIRBANKS-MORSE VICTORY MODEL 757—Inspection car is similar to Model 57, but belt-driven.



SHEFFIELD MODEL 34-B—Inspection car for 1 to 4 men. Has 5- to 8-hp., water-cooled engine—self-centering, powerful brakes, wood center wheels—adjustable rear axle box—and is chain-driven. Model 754-B is belt-driven.

Buy War Bonds

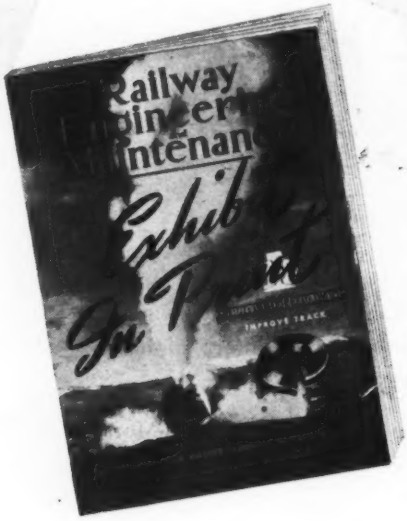
FAIRBANKS, MORSE & CO.

FAIRBANKS-MORSE BUILDING, CHICAGO 5, ILLINOIS

Canadian Fairbanks-Morse Co., Ltd., Montreal

MEMBER 1944

ROADMASTERS' ISSUE AND



OCTOBER

Railway Engineering and Maintenance

"That's the Answer, Bill!"

An Exhibit in Print "The Answer"

"Boss, I suppose you've heard that the Roadmasters found it necessary to cancel their Annual Meeting again this year," said the star salesman to his railway sales manager.

"Yes, that's the word, Bill, and I was awfully sorry to hear it because there's an organization that really does a job—that's a working organization if there ever was one. Furthermore, I understand they have ready for presentation some of the best reports ever."

"Yes, I've heard the same thing, but apparently they couldn't do anything but cancel this year. However, I'm not so concerned about their not meeting, because their reports are going to be published promptly in the October issue of *Railway Engineering and Maintenance*, which will be called the Roadmaster's Meeting-in-Print number. What I'm concerned about is that, 'no meeting—*there will be no exhibit of the Track Supply Association.*' That means that for a second successive year we won't have an opportunity to bring our products directly before the Roadmasters."

"That's right, Bill, and no one regrets any more than I that there won't be an exhibit, but I'm way out ahead of you this time on how to get our products before the Roadmasters—and effectively, too. That same October issue that you were talking about is also going to be an Exhibit-in-Print number—I got the dope on that this morning. We'll tie our regular advertising right in with the Roadmasters' activities, just as we used to do when there was a convention and exhibit."

"Say, that's a swell idea, but, what do you mean 'our regular advertising?' Why, we should at least double our space in that issue—really tell our story. You know, that issue's going to be sent to every member of the Roadmasters' Association, and that's in addition to the hundreds of other key engineering and maintenance officers on the railways."

"Bill, I think you've got something—enough said, but I'll have to step on it, because, if I recall correctly, forms for that issue close on September 20.

RAILWAY ENGINEERING AND MAINTENANCE IS READ BY MAINTENANCE OFFICERS OF ALL RANKS

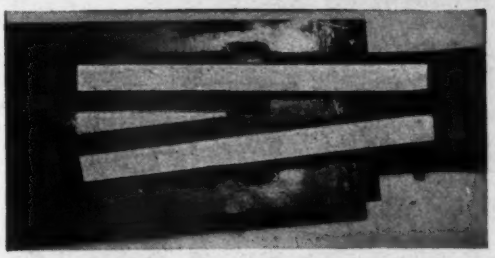
SIMULTANEOUS FLAME HARDENING AND TEMPERING

lengthens life of open hearth steel frogs

INCREASE the wear resistance of new carbon steel frogs and thereby lengthen their service life by using the modern method of simultaneous flame hardening and tempering. First developed by Airco's Field Engineering Staff, this economical surface hardening method imparts a hard "skin" to frog points and wing rails at the areas where wear is usually most severe. It provides sufficient hardness to retard wear and reduce battering of the surface to a minimum without affecting the toughness and shock resistance of the core metal.

The actual mechanical application of Airco's Simultaneous Flame Hardening and Tempering is simple, speedy, and economical. The most practical method is to immerse each of the component parts of the frog almost completely in a tank containing a soluble oil solution. An Airco No. 4 Radiagraph machine, equipped with quenching jet and torches for heating and tempering, travels at a regulated speed on a track alongside the tank. Thus, in a single progressive operation the frog wearing surfaces are flame hardened and tempered.

Air Reduction's Railroad Engineering Service Division will provide complete information and technical assistance on this application of the oxyacetylene flame. For full details write to Department REM, New York office.



This view of an assembled frog shows the areas (chalk-marked) which have been flame hardened.

Close-up of the operation showing the hardening flame, quenching jet and tempering flame.

★ BUY UNITED STATES WAR BONDS ★

AIRCO WILSON

AIR REDUCTION

General Offices: 60 EAST 42nd STREET, NEW YORK 17, N. Y.

In Texas: MAGNOLIA AIRCO GAS PRODUCTS CO. • General Offices: HOUSTON 1, TEXAS

Offices in all Principal Cities

TYTAMPING
CRIB BUSTING
BREAKING
DRILLING
DRIVING

BARCO
UNIT TYTAMPER

Whether it's a job for one man or a crew, Barco Unit Tytampers increase individual output. Self-contained they eliminate complications on group work; readily portable they handle occasional jobs without requiring special crews and equipment. Barco Tytampers are simple, rugged and adaptable for many railroad uses. For further information, write to: The Barco Manufacturing Company, Not Inc., 1805 Winnemac Ave., Chicago 40, Illinois.

•

In Canada: The Holden Co., Ltd., Montreal

THE FREE ENTERPRISE SYSTEM IS THE SALVATION OF AMERICAN BUSINESS

Good Line and Surface—necessary for increased speeds—can only be maintained with a clean roadbed.

The McWilliams "Mole" Ballast Cleaner keeps roadbeds in first class condition, and its ballast cleaning job is done speedily and economically.

Mole Ballast Cleaners are available in border or intertrack models.

RAILWAY MAINTENANCE CORP.
PITTSBURGH 30, PENNSYLVANIA

Write today for complete information

Duff-Norton TRACK Jacks

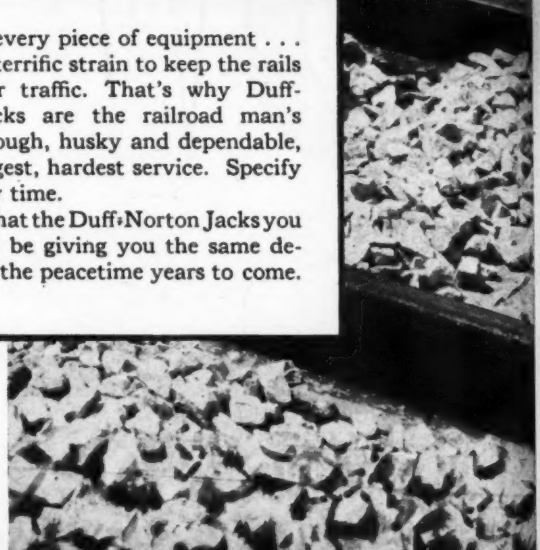
They're built tough and husky to give you long service on your

TRACK WORK

Every worker . . . every piece of equipment . . . they're all under a terrific strain to keep the rails open for vital war traffic. That's why Duff-Norton Track Jacks are the railroad man's favorite! They're tough, husky and dependable, even under the longest, hardest service. Specify Duff-Nortons every time.

Remember, too, that the Duff-Norton Jacks you buy today will still be giving you the same dependable service in the peacetime years to come.

Write for Catalog 202... gives you complete application data, descriptions and specifications for Duff-Norton Jacks.



THE DUFF-NORTON MANUFACTURING COMPANY

PITTSBURGH, PENNSYLVANIA

Canadian Plant: COATICOOK, QUEBEC

Representatives in Principal Cities

American

MATERIALS HANDLING FOR RAILROAD STORES DEPARTMENT

with

American LOCOMOTIVE CRANE

When it comes to materials handling with magnet, bucket, or hook, you can't beat the modern design AMERICAN Locomotive Crane for maneuverability and for ease and convenience of operation. Besides handling materials in the reclamation yard, this AMERICAN Locomotive Crane several times a year travels over 800 miles with the supply train, picking up scrap along the way.

Now is the time to look into improving your materials handling methods. Catalog 600-L-1A illustrates and describes the many features that make the AMERICAN Locomotive Crane really modern.

4442

Plan now . . . but wait for **AMERICAN!**

AMERICAN MATERIALS HANDLING *for* EVERY INDUSTRY

AMERICAN HOIST & DERRICK CO.

Saint Paul 1, Minnesota

CHICAGO SAN FRANCISCO NEW YORK

Wherever wire rope is fastened . . . use genuine **CROSBY CLIPS** *with the Red-U-Bolt*

In giant presses sheets of selected Douglas fir veneer, a bonding agent of heat-set plastic, and a surfacing film of a remarkable new fibrous plastic are permanently fused together. The result—INDERON.

Facts About INDERON for Postwar Planners

WHAT IS INDERON?

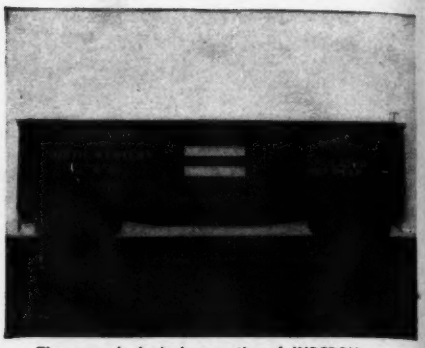
INDERON is a **new** stabilized structural product. Douglas fir veneers, plastic glues and a fibrous plastic film are chemically and infrangibly united under high heat and pressure to produce a complete, finished material in large panel form. INDERON is neither a plastic nor a plywood, but an alloy retaining the better qualities of both.

WHAT ARE THE PROPERTIES OF INDERON?

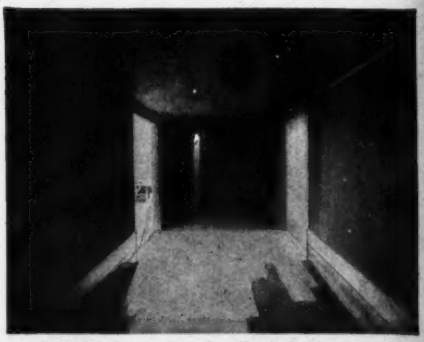
INDERON is waterproof, with a dense hard finish highly resistant to abrasion, impact, vapor permeation and water absorption. INDERON needs no surface protection, no decorative treatment, no structural support. INDERON is stable. It does not warp or twist. It combines BEAUTY . . . STRENGTH . . . DURABILITY.

IS INDERON CURRENTLY AVAILABLE?

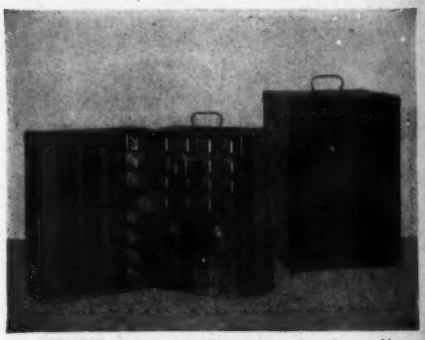
INDERON, developed primarily as a packaging material for the Air Corps, was later adopted by all branches of the services for a wide range of specialized applications, particularly where resistance to tropical fungus, termites and weathering was important. While these vital war needs have taken practically all production, INDERON testing and research have continued—and after the war this unusual product will emerge as a new, distinctly **different** structural material.



The unusual physical properties of INDERON suggest many uses in coach and car construction. As a liner for the Chicago and Northwestern wet pulp car, shown above, all necessary requirements for this difficult type of service were met by INDERON. It is tough, hard, easy to install, low in cost.



INDERON is waterproof, effectively stops vapor transmission, creates an enduring surface, can be installed on both the interior and the exterior of freight cars. INDERON is considerably stronger than plywood, needs no paint or finish.



INDERON is successfully serving the Army Air Corps as the preferred material for packaging many vital parts, medical supplies and delicate instruments. INDERON has also been used for many other important war purposes, and has proven its ability to resist tropical fungus, termites, weathering and water immersion.

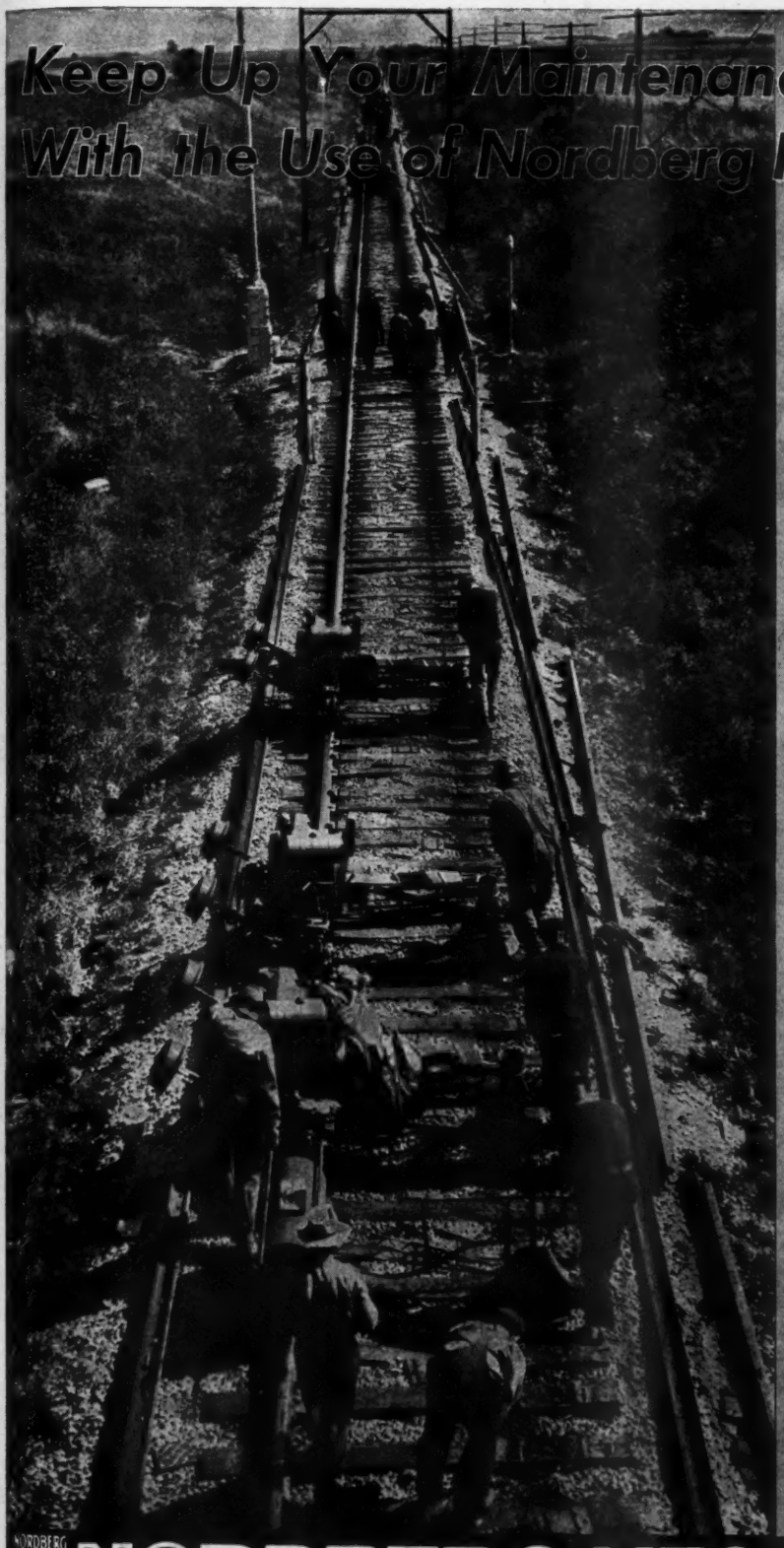
INDERON

THE *Stabilized* STRUCTURAL PRODUCT

Buffelen Lumber & Mfg. Co.
Tacoma 1, Washington
Washington Veneer Co.
Olympia, Washington
manufacturers

Chicago Sales Office:
9 So. Clinton St., Chicago 6

Keep Up Your Maintenance Schedule With the Use of Nordberg Power Tools



Adzing Machine

Rail laid on properly prepared machine adzed ties is held in better alignment and does not require regauging.

Spike Puller

Rapid removal of spikes speeds up rail laying operations. One machine pulls 30 to 40 spikes per minute.

Track Wrench

Fast, uniform tightening for rail laying jobs and for periodic maintenance of joints.

Rail Drill

A simple, easily handled machine wherever rail, switches, crossings, etc. are drilled.

Rail Grinders

Five types of grinders specially developed for every rail grinding requirement.

Power Jack

Fast, positive, hydraulic power jack will easily keep ahead of any ballasting gang.

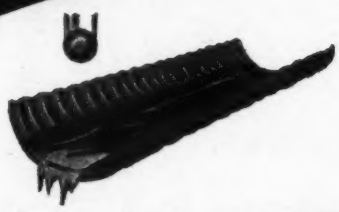
NORDBERG MACHINERY

NORDBERG MFG. CO. MILWAUKEE WISCONSIN

Export Representative—WONHAM Inc.—44 Whitehall St., New York

NO OTHER PIPE gives you ALL THESE ADVANTAGES

This is why Asbestos-Bonded ARMCO Pipe has been cutting maintenance costs on drainage for almost 10 years.....

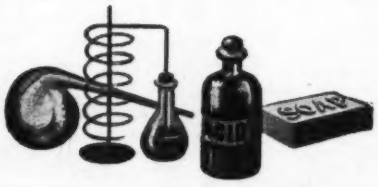


3 Resists Spalling, Cracking, in Cold Weather

The coating can endure low temperatures with little danger of spalling or cracking. In a typical test, a steel ball weighing 1.67 pounds is dropped on a frozen sample of Asbestos-Bonded Pipe from a height of 7.5 feet. There was no spalling of the coating.

1 Prevents Bottom Wear

In any drainage pipe the wear is hardest on the bottom. To offset this, Asbestos-Bonded Pipe is reinforced in the bottom with a smooth bituminous pavement. In erosion tests the pavement has lasted four times longer than the specifications required.



4 Protection Against Acids, Alkalies, Gases

Under severely corrosive conditions, ARMCO's bonded coating gives complete and lasting protection. Field test exposures to acids and alkalies have continued several years without damage to the coating.

2 Does Not Flow Under Summer Heat

Specimens of Asbestos-Bonded Pipe are heated to 160 degrees F. for four hours. The pavement "flows" less than a quarter of an inch. This temperature is appreciably hotter than unbonded material will stand and higher than actual service conditions.

Only Asbestos-Bonded Pipe can give you the proved advantages of the strength and flexibility of corrugated metal, the durability of ARMCO Ingot Iron, and a special bituminous pavement and coating.

You can obtain Asbestos-Bonded ARMCO Pipe on priority in diameters from 8 to 96 inches, with lengths up to 20 feet. Armco Railroad Sales Co. Incorporated, 2941 Curtis St., Middletown, Ohio

EXPORT: THE ARMCO INTERNATIONAL CORPORATION

ARMCO RAILROAD SALES CO. INCORPORATED

A NATION-WIDE LOCKER CHECKING SERVICE

ALL STATIONS — present, new or remodeled — should include parcel checking lockers. Self-service lockers have become an integral part of modern transportation in the eyes of the travel-wise public of today. . . . Ask busy travelers and they tell you: "Lockers are more convenient; no waiting in line. They save time on arrival, save time at departure; they're private; they're safe; they're easily accessible and all for a dime."

Parcel locker checking has increased over four times in the last three years. It accounts for over 60% of all parcel checking in stations and terminals. It gives maximum service in minimum space, with smart, modern equipment designed to harmonize with the streamlined trends in transportation... Remember to specify American Lockers. Our consultants will confer with you and make surveys and recommendations without obligation.

AMERICAN LOCKER COMPANY, Inc.

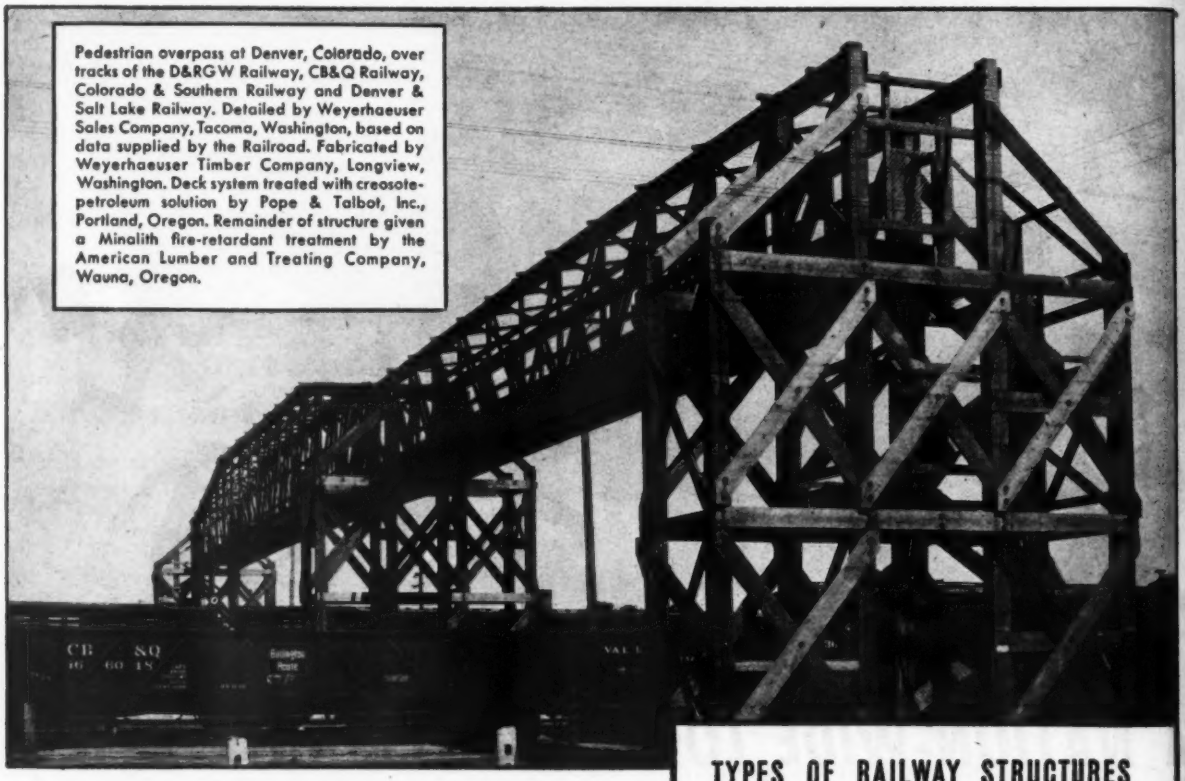
211 CONGRESS ST., BOSTON 10, MASS.

DISTRICT OFFICES

BOSTON NEW YORK PHILADELPHIA PITTSBURGH ATLANTA CLEVELAND CHICAGO DALLAS LOS ANGELES

TODAY THEY ALL "GO" FOR PARCEL CHECKING LOCKERS

70 RAILROADS USE TECO CONNECTORS FOR TIMBER STRUCTURES



Pedestrian overpass at Denver, Colorado, over tracks of the D&RGW Railway, CB&Q Railway, Colorado & Southern Railway and Denver & Salt Lake Railway. Detailed by Weyerhaeuser Sales Company, Tacoma, Washington, based on data supplied by the Railroad. Fabricated by Weyerhaeuser Timber Company, Longview, Washington. Deck system treated with creosote-petroleum solution by Pope & Talbot, Inc., Portland, Oregon. Remainder of structure given a Minalith fire-retardant treatment by the American Lumber and Treating Company, Wauna, Oregon.

American and Canadian railroads—more than 70 of them—use the Teco connector system of construction for their heavy duty timber structures. The pedestrian overpass illustrated above, contains one 170 ft. span and one 90 ft. span.

Railroad engineers and architects are using the Teco system of construction for a wide range of structures such as listed at right.

A nation-wide list of Teco fabricators is at your service—names on request. Write for free bulletins.

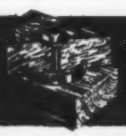
TYPES OF RAILWAY STRUCTURES USING TECO TIMBER CONNECTORS

1. Roof Trusses
2. Overhead Cranes
3. Timber Bents
4. Connections between pile heads and caps
5. Trestles
6. Ballast deck stub piles
7. Piers
8. Pier Fenders
9. Sway Bracing
10. Coal Pockets
11. Auto Loading Dock
12. Between Rail Post and Tie Connections
13. Bridge Decks
14. Scaffolding
15. Cooling Towers
16. Warehouses

TIMBER ENGINEERING COMPANY, INC., of WASHINGTON, D. C.
WASHINGTON · CHICAGO · MINNEAPOLIS · NEW ORLEANS · SAN FRANCISCO

Foreign Distributors

V. H. McIntyre, Ltd, Toronto, Canada
MacAndrews & Forbes, Ltd., London, England
Timber Engineering Company, Sidney, Australia
Murie & Company, Ltd., Wellington, New Zealand
The Ford Company, Inc., Panama City, Panama
Standard Machinery & Supply Company, Mexico, D. F.



SPECIFY TECO CONNECTORS AND TOOLS

Endorsed by Leading Lumber Manufacturers & Fabricators

DRIVE MORE RIVETS PER HAMMER . . . AT LESS UPKEEP COST

with *Thor* **RIVET SETS and CLIPS**

A Size, Shape and Cupping for Every Type of Rugged Shop Riveting!

Specify Thor—
if you want rivet sets that are built to make your riveting hammer last longer . . . to increase its efficiency on the toughest long stroke jobs, at less cost!

Designed to fit every size and make of hammer.

All sizes and cuppings to drive every type of rivet head—button, liverpool, pan, cone or steeple.

High grade alloy steel construction.

Heat-treated for durability.

Precision-ground after heat-treating to close tolerances to fit the nozzle perfectly . . . to provide smooth, steady blows that reduce wear on the nozzle.

Specify Thor—
for the rivet set clips that are treated and finished to provide sturdy locking of the set.

Top grade spring steel construction.

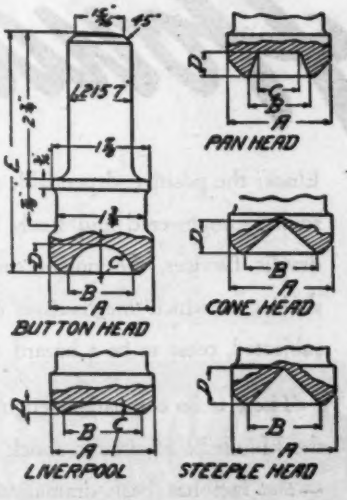
Specially heat-treated for durability.

Finished and coated against corrosion by sand-blasting that removes furnace scale, tumbling that eliminates all foreign matter, and a finishing coat of lacquer for *longer* protection.

●

Call your nearest Thor representative today or write for complete information on Thor Rivet Sets and Clips and other Thor Accessories for every type of pneumatic and electric tool.

RIVET SETS CLIP



Thor **Portable Pneumatic and Electric Tools**

INDEPENDENT PNEUMATIC TOOL COMPANY

600 W. JACKSON BOULEVARD, CHICAGO 6, ILL.

Branches in Principal Cities

On roads, rails and in the sky—in every land—in every language . . .

Houdaille* means "SHOCK ABSORBER"

Under the positive, dependable and gentle control of soundly engineered and finely built Houdaille Hydraulic Devices, the violent thrusts, vibrations and shocks, to which mechanisms of transportation are subjected, cease to be a hazard or a discomfort.

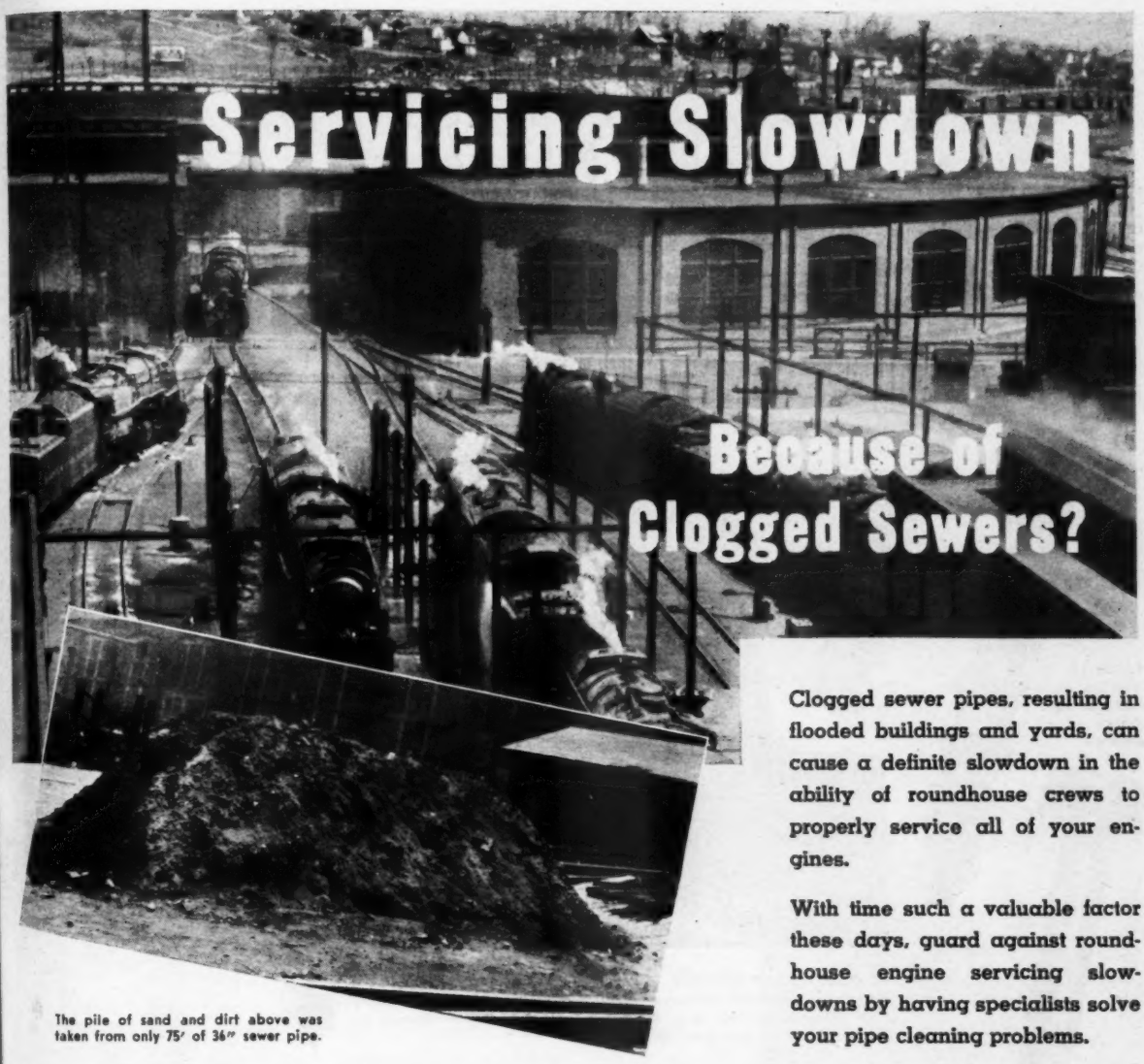
There is no comparable engineering substitute for the Houdaille Hydraulic shock absorption principle —*that* fact has been dramatically confirmed under present war conditions. And it is inevitable that new and far-reaching Houdaille adaptations of this basically sound principle will increasingly smooth the paths of civilization in the days ahead.

HOUDE ENGINEERING DIVISION OF
HOUDAILLE-HERSHEY CORPORATION
Makers of Hydraulic Controls
BUFFALO 11, NEW YORK

BUY U. S. WAR BONDS

*Pronounced "HOO-DYE"

Servicing Slowdown Because of Clogged Sewers?

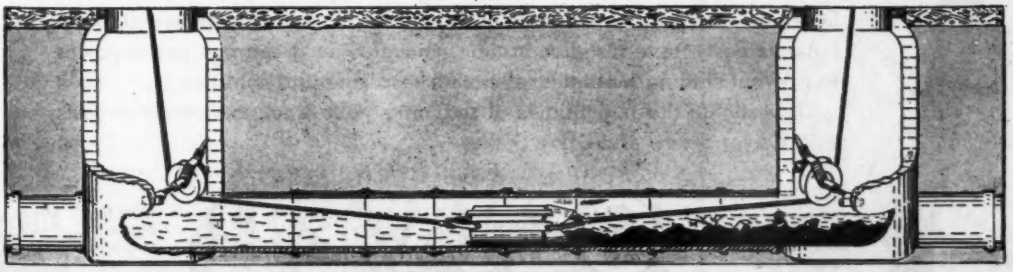


The pile of sand and dirt above was taken from only 75′ of 36″ sewer pipe.

Clogged sewer pipes, resulting in flooded buildings and yards, can cause a definite slowdown in the ability of roundhouse crews to properly service all of your engines.

With time such a valuable factor these days, guard against roundhouse engine servicing slowdowns by having specialists solve your pipe cleaning problems.

LET PITTSBURGH PIPE CLEANER COMPANY CLEAN YOUR SEWERS



PITTSBURGH PIPE CLEANER COMPANY

433 Melwood Street — Pittsburgh 13, Penna.

OLIVER

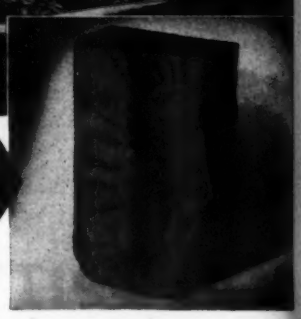
SCREW and DRIVE SPIKES

Save Vital Man Hours!

Umbrella Head Screw Spike with Rolled Pilot Point.

Hold Down Drive Spike—Can be installed without wrenches.

The new Oliver Timber Spike for trestles and other structures.



TWELVE YEARS SERVICE. This unretouched photograph showing a section of red oak tie in heavy traffic service for twelve years, attests security of the Oliver Screw Spike grip. Note the clearly defined screw threads, the absence of rust, rot and fibre ruptures.

Oliver presents a complete line of Screw and Drive Spikes developed to meet railroad demands for dependable, long lasting, easily installed fasteners. Thoroughly tested in railroad service, these products cut maintenance costs, save installation time, and provide greater gripping power to prevent shifting tie plates, eliminate respiking and split ties.

Investigate the possibilities of reducing *your* track maintenance costs with Oliver Screw and Drive Spikes.

Oliver makes a Complete Line of Specialized Railroad Fasteners, Washers and Rivets.

OLIVER
IRON AND STEEL
Corporation

Write for OLIVER Catalogue No. 4 RAILROAD ACCESSORIES

SOUTH TENTH AND MURIEL STREETS · PITTSBURGH, PENNSYLVANIA

Even Steel Must Wear Armor...

Against biting, cinder-laden wind . . . slow, seeping moisture . . . even steel must wear Armor.

Every Railway Engineer knows what it is to face especially difficult maintenance problems involving steel structures.

Corrosive gases from locomotive blast . . . cinder abrasion . . . seeping water forming acid solutions . . . these are only a few of the conditions that make effective protection so highly important.

For more than 40 years, The Flintkote Company has pioneered in the development of Industrial Asphalt products for metal protection . . . armor against corrosion. Special emphasis has been placed on railway requirements.

Complete metal protection with Flintkote Protective Coatings offers triple economy. Material cost is comparatively low. Application is fast and simple. Long years of effective protection cut recurrent maintenance costs.

FLINTKOTE
INDUSTRIAL PRODUCTS

The Flintkote Company . . . Industrial Products Division . . . 30 Rockefeller Plaza, New York 20, N. Y.

ATLANTA • BOSTON • CHICAGO HEIGHTS • DETROIT • LOS ANGELES • NEW ORLEANS • WACO • WASHINGTON • TORONTO • MONTREAL

A PAGE OF EXPERIENCE FROM SOUTHERN RY. SYSTEM

1939—As an experiment—put 3 Allis-Chalmers Tractors on ditching, sloping and realignment.

1944—Five years experience PROVE tractors a big success. Now have 19 Allis-Chalmers units. More will be added as conditions permit.

Some Benefits Gained from using Tractors:—

① Release work trains for handling war traffic.

② Carry on grading and maintenance without interference to train schedules.

③ Make drainage ditches to any desired depth—not possible with steam ditchers—Do it at less cost!

④ Handle curve realignment projects that involve the movement of big yardage with maximum efficiency, economy and safety.

⑤ Flexibility enables tractors to be used on most any type of grading work, at any location, anytime.

SPECIAL NOTE:— Every Railroad can profit, from every angle, by using Allis-Chalmers Tractors for off-track work.

Southern equipped their tractors with scrapers and bulldozers. Shown here is a 2-Cycle Diesel with bulldozer. A number of these Diesels are owned by Southern.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

Flame-Harden Rail Ends To Increase Batter-Resistance

• When the hardness of rail ends is increased by Oxweld's oxy-acetylene flame-treatment, end batter is retarded so effectively that a true riding surface is preserved for years. Thus rolling stock rides more smoothly, wear on joint bars and bolts is lessened, and rail maintenance work is substantially reduced.

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No. 189 of a Series

Railway
Engineering and Maintenance

SIMMONS-BOARDMAN PUBLISHING CORPORATION

105 WEST ADAMS ST.
CHICAGO, ILL.

Subject: "Service"

September 1, 1944

Dear Reader:

On August 14, as reported in the news columns of this issue, the Executive committee of the Roadmasters' Association, meeting in Chicago, cancelled its plans for an annual meeting this year, which was to have been held in Chicago on September 19-21. It was a difficult decision to make because of what the annual meeting means in the life of the Association and to maintenance men generally, but it was the only decision that could be made under the circumstances, when the Office of Defense Transportation is frowning upon all large group meetings to minimize train travel, and, too, when so many of the members of the Association, in the face of added responsibilities, would find it difficult to attend.

The reports that would have come before the annual meeting will be passed upon at a meeting of the Executive committee in Chicago on September 20, and to get them promptly before members and other railway engineering and maintenance officers generally, the Roadmasters have asked that their reports be published in the October issue of Railway Engineering and Maintenance.

Needless to say, it was a pleasure to comply with this request, and plans are being made to that end. In no other way do we feel we could render a more valuable service to the members of the Roadmasters' Association and to our other readers. Furthermore, Railway Engineering and Maintenance has agreed to preprint the reports so that copies will be available for all those who attend the Executive committee meeting, and also to send, without cost, a copy of the final reports as published in the October issue, to any member of the Association who is not a regular subscriber.

Thinking about this matter, it occurs to me that it will be of interest to you to know that there is nothing unusual in this procedure—that, after all, this is something that Maintenance has done year after year, almost since it became a Simmons-Boardman publication in 1916. In practically all of those years when there were annual meetings, this publication even published an advance issue of its Convention number, containing all of the committee reports, for distribution at those meetings. Many of you will remember this procedure over the years.

It has been with pleasure and pride that we have rendered this service year after year to the Roadmasters and to other railway engineering and maintenance officers, and I want to express the appreciation of the entire staff of our publication to the Roadmasters for their co-operation, which alone has made this possible. Between us, we feel that we have rendered a real service. I hope that you agree.

Yours sincerely,

Elmer T. Howson

ETH:GP

Editor

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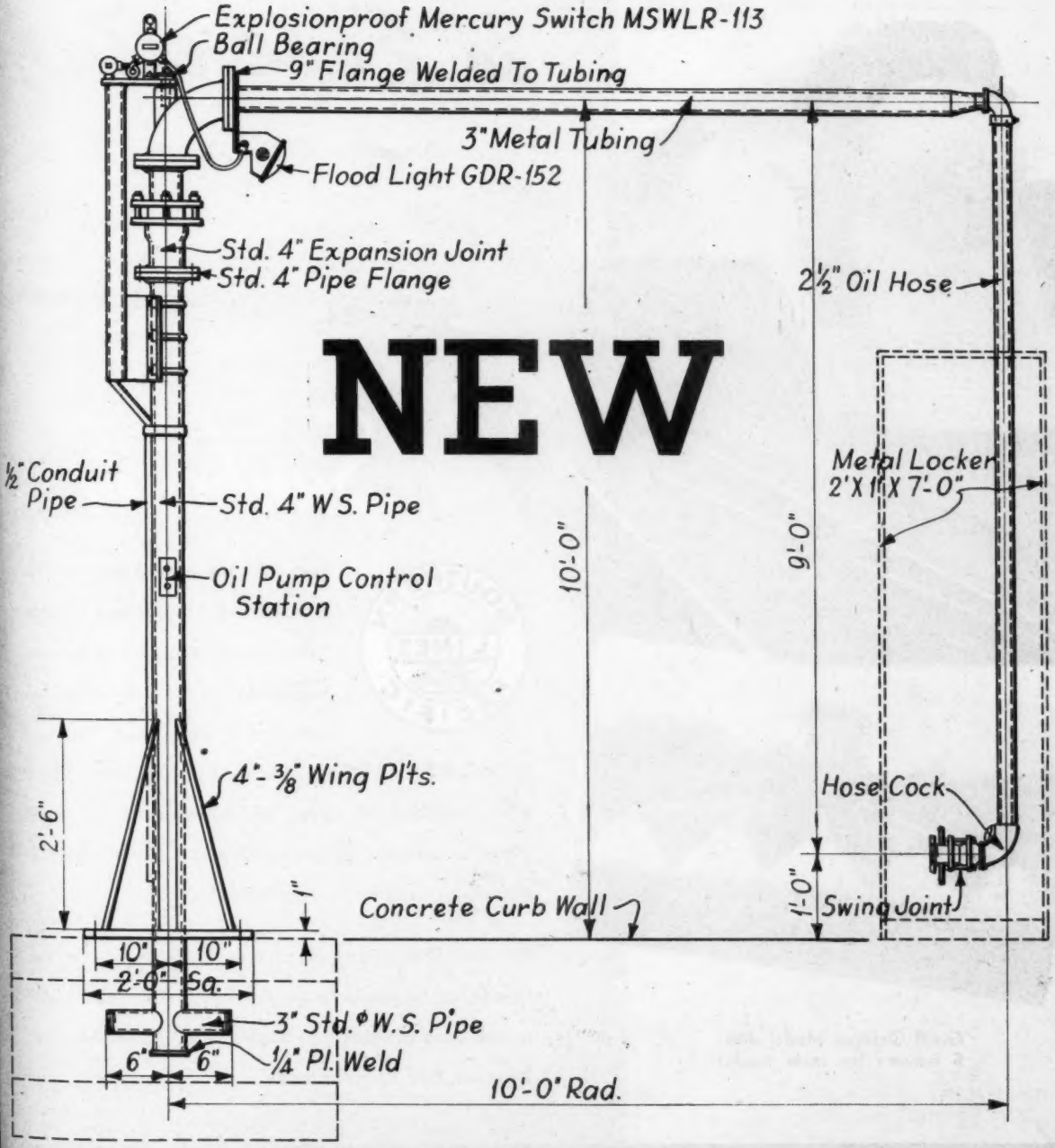

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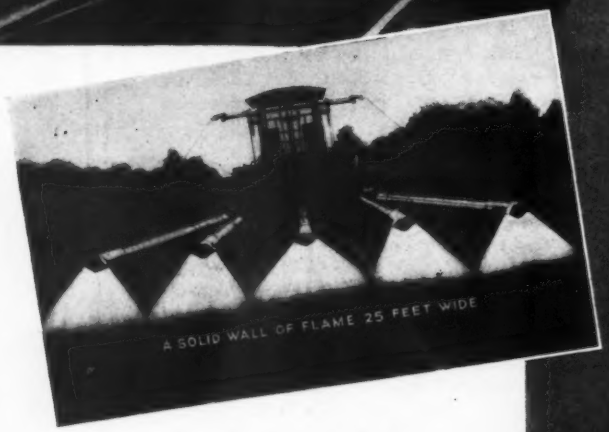

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Railway Engineering and Maintenance

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SEPTEMBER, 1944

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The War—Labor Shortage—High School Boys—Supervision—Freight Offices

Adapts Modern Grading Equipment to Many Railway Needs - - 790

Tells how the Southern Pacific is employing many types of modern, company-owned grading equipment for a wide variety of work

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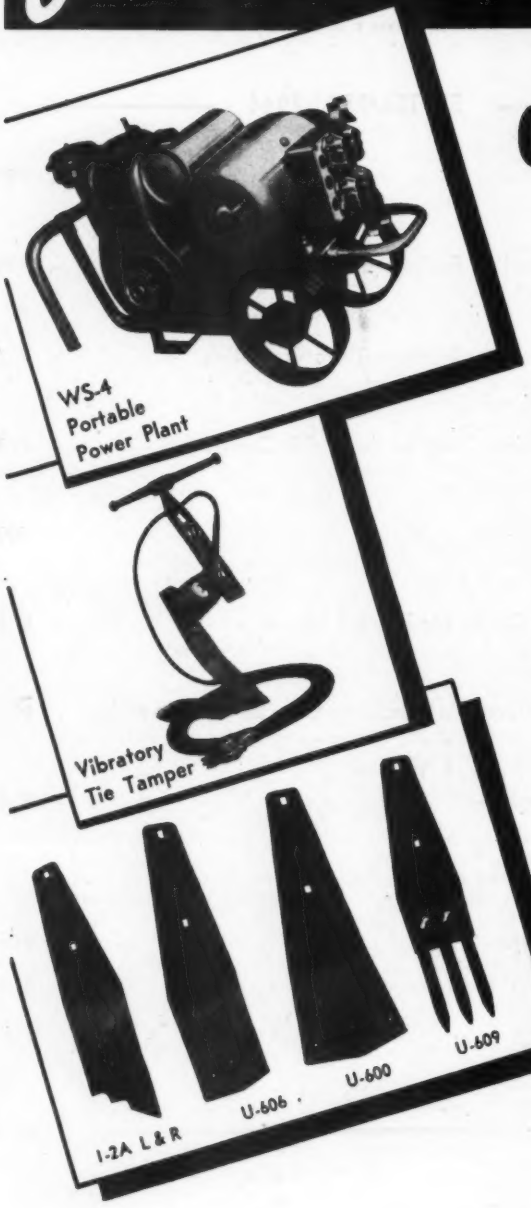

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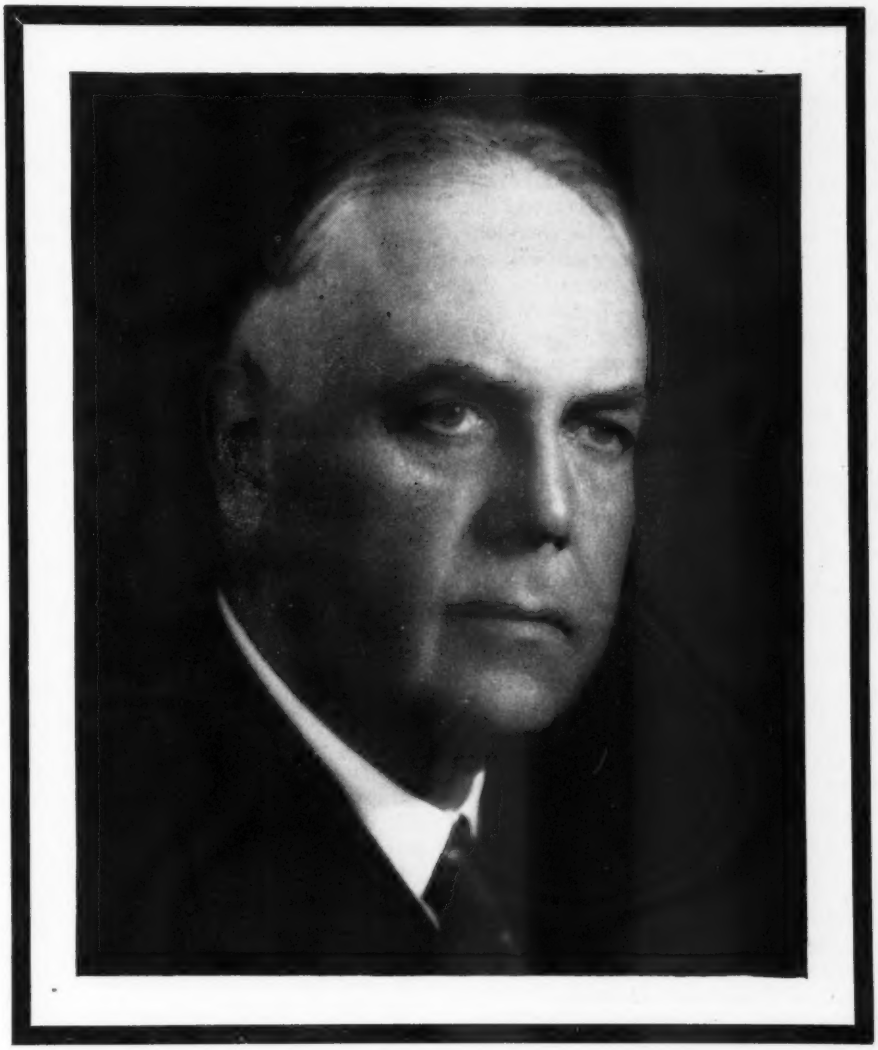


Elmer Thomas Howson Dies

Editor of *Railway Engineering and Maintenance* for 28 Years, And an Outstanding Authority on Railway Matters, Passes On

ELMER THOMAS HOWSON, editor of *Railway Engineering and Maintenance*, editor of the Railway Engineering and Maintenance Cyclopedia, western editor of the Railway Age, and vice-president and director of the Simmons-Boardman Publishing Corporation, the publisher of these and other railway publications, died in the Presbyterian hospital, Chicago, on September 1, after a relatively short illness. He was 60 years old and had been editor of *Railway Engineering and Maintenance* for more than 28 years.

Thus, abruptly and untimely, ended a brilliant career of railroad man, engineer, editor, publisher and active member in many technical associations, societies and clubs, the impact of which will be felt widely in the railway field—the field to which he had dedicated his entire business life.

Born in Folletts, Iowa, on May 23, 1884, Mr. Howson received his higher education at the University of Wisconsin, where he was elected a member of the honorary engineering society Sigma Xi, and from which he was graduated in 1906 with the degree of Bachelor of Science in Civil Engineering, subsequently receiving a full degree in Civil Engineering in 1914.

Having already chosen his life's work while at the university, Mr. Howson undertook his first railway position in 1903, with the Iowa and Illinois (now Clinton, Davenport & Muscatine), working during his vacation period of that year. Returning to the same road during the summer of 1904, he was appointed instrumentman, and then, following graduation in 1906, he immediately accepted employment with the Chicago, Burlington & Quincy

as resident engineer, soon becoming assistant engineer on that road's heavy reconstruction work in Wisconsin and Illinois. In 1911, Mr. Howson was promoted to division engineer of the road's La Crosse division, with headquarters at La Crosse, Wis., in charge of maintenance and the extensive reconstruction and second-track work under way on that division at the time. Having attracted the attention of higher officers of the road, he was definitely on his way to still larger responsibilities when, on February 1, 1911, he was called to the staff of the Railway Age (then the Railway Age Gazette) by its present editor-in-chief, Samuel O. Dunn, who was searching for a man of broad capabilities to build further engineering prestige into that publication, and who had been attracted to this young, promising engineer on the Burlington.

Accepting the offer of the Railway Age, Mr. Howson, as engineering editor, soon made his influence felt in a large way, not alone in the pages of that publication, which immediately began to assume leadership in the coverage of current railway construction and maintenance practices, but also in the railway field generally, as the result of his extensive traveling and insatiable desire to know railway men and to study their problems. Not satisfied, however, with the outlet which the Railway Age alone afforded for disseminating engineering and maintenance information, in which the space available for covering the activities of each railway department was necessarily limited, and convinced that there was a field for an associated publication dealing primarily with matters relating to track, bridges, buildings and water service facilities, addressed directly to those in charge of these facilities, he was soon promoting the creation or acquisition of such a publication. As a result, in June, 1916, the Simmons-Boardman Publishing Corporation (then the Simmons-Boardman Publishing Company) took over by purchase the then outstanding publication in this field—Railway Engineering and Maintenance of Way—and incorporated it into its growing list of transportation publications under the name of Railway Maintenance Engineer.

Continuing as engineering editor of the Railway Age, Mr. Howson became editor of this new publication, issued monthly, the name of which was subsequently changed, in 1923, to *Railway Engineering and Maintenance*. In addition, in 1919, he was appointed western editor of the Railway Age, and subsequently, in 1931, was elected vice-president and director of the Simmons-Boardman Publishing Corporation, extending his influence over all of the publications of the corporation.

As directing head of *Railway Engineering and Maintenance*, Mr. Howson's principal and constant endeavor was to render through the pages of that publication maximum help to railway engineering and maintenance officers. This he did not alone by reviewing the current activities in the field, but also through his editorials, which were designed to stimulate constantly improved construction and maintenance practices. In more recent years especially, his lead editorials have been directed to apprising engineering and maintenance officers of the broader phases of railroading.

Convinced that beyond the pages of *Railway Engineering and Maintenance* there was a still further opportunity to serve those on the railways concerned directly or indirectly with railway engineering and maintenance matters, Mr. Howson, in 1919, sponsored and was appointed editor of the first edition of the Railway Engineering and Maintenance Cyclopedia, a triennial volume which brings together under one cover the latest approved standards and practices in all branches of railway construction and maintenance.

In the interest of his profession as an engineer and railway editor, Mr. Howson had long been a member of many technical associations, societies and clubs, always taking an active part in their affairs, which invariably elevated him to positions of influence and responsibility. Among these groups were the American Railway Engineering Association, of which he was a director, chairman of its Arrangements committee, and chairman of its Committee on Co-operative Relations With Universities at the time of his death; the American Society of Civil Engineers, of whose Illinois section he was president in 1927; the American Association of Railroad Superintendents, of whose Program and Arrangements committee he was chairman; the Western Society of Engineers, of which he was president in 1924-1925; the American Wood-Preservers' Association, of which he was president in 1932; the Roadmasters' and Maintenance of Way Association, of which he was president in 1934; the American Railway Bridge and Building Association, of which he was president in 1927; the Western Railway Club, of whose Program and Arrangements committee he was chairman for a number of years; and the Maintenance of Way Club of Chicago, of which he was a charter member in 1921, and for which he has served in many capacities, ending with the chairmanship of its Program committee.

Never considering his health or personal affairs, Mr. Howson gave unstintingly of his time and thought to all of these organizations over the years, a practice which was his delight, but one which, along with his many other responsibilities, forced him into a routine of long, intensive hours, which, undoubtedly, constituted a heavy drain on his nervous system. Furthermore, his unusually wide capacity and energy frequently set a pace beyond the ability of his friends and associates to match. Instinctively, he sought action and results, but he never asked beyond a point he was more than willing to go himself.

Mr. Howson was a member of the Union League Club, the South Shore Country Club and the Chicago Engineers' Club, but he used the facilities of these clubs almost entirely to entertain his railway friends and as a place where he could discuss their problems with them at luncheon or beyond office hours.

Railway Engineering and Maintenance

The War—

Not Over Until the Last Shot Is Fired

With the rapid advances that American forces and those of our allies have been making on the Eastern and Western fronts in Europe during recent weeks, there has been growing evidence of a belief among many workers in war industries that "it is practically over," and of a tendency toward relaxation of the strenuous effort needed to keep abreast of the war demands of the country. Unfortunately, this same attitude has been evidenced among some railway officers and employees—that there can be some let-down in the strenuous effort required to maintain the tracks, structures and other facilities of the railways to the standard that is needed to keep war traffic moving at its present pace.

Maximum Rail Service Must Continue

That this is a premature point of view goes without saying. It is a military axiom that no effort should be spared to crush the enemy so long as his forces remain intact or he is still capable, or potentially capable, of resistance. The battle now going on in Northern France is likely to become one of the decisive battles of history, but the Nazis are not yet crushed, nor are they likely to be for some time. The expenditure of ammunition, equipment and supplies in recent weeks has been proceeding at a rate never before equalled, and this rate is still accelerating, so that the continued manufacture and shipment of these requirements is not only necessary, but imperative.

This view of the situation is confirmed by spokesmen for both the Army and the Navy, as well as for the War Labor Board and the Office of Defense Transportation, each of whom has been outspoken in statements that, despite the gratifying successes to date, the war is not over yet. These agencies have emphasized that even with Germany knocked out, we will still have a major war on our hands; a war with Japan that is going to require a vast expenditure of men and materials before Victory is achieved.

Direction, Not Volume of Traffic Will Change

It has also been pointed out that a cessation of the flow of men and supplies to Europe does not mean that this flow will stop, or even that it will be reduced, but rather that it will change direction and begin to flow westward instead of eastward. In other words, it is expected that men and supplies will be needed for the campaign or campaigns against Japan on the same scale as they are now needed against Germany. Our war requirements may change somewhat and may permit the conversion of some war plants to production for civilian use, but even in that event, the railways will be essential to that production.

In the face of these probabilities, no maintenance officer or employee should permit himself to relax his efforts to the slightest degree, because it is certain that a collapse of the German army, even if it comes today, tomorrow or next week, will have little immediate effect upon the effort required by *railway men* to carry the war to a successful conclusion. Thus far, the railways have done a remarkable job in handling the extraordinary war-time traffic of the country; they must not jeopardize that record by any poorly-advised, premature relaxing of their effort now.

Labor Shortage—

Have All the Possibilities Been Explored?

ALTHOUGH the war appears to be drawing rapidly to a final decision, at least in Europe, the problems imposed on the railroads by wartime conditions have, on the whole, shown little indication as yet of becoming substantially less difficult of solution. Speaking broadly, the number one problem is still the labor shortage, and reports indicate that, somewhat contrary to what might be expected at this stage of the war, maintenance officers in many localities are still falling considerably short of obtaining the number of men needed to carry out authorized work programs. To be more specific, some railroads are still unable to obtain more than 60 or 70 per cent of their requirements for labor.

At this stage, with the labor shortage a problem of several years standing, it might be assumed that the railroads had exhausted all the possibilities for obtaining and holding labor. Many roads have established labor camps as a means of attracting and holding casual workers; they have brought in large numbers of Mexican Nationals; and they have been able to acquire the services during summer vacations of considerable numbers of high school boys. These and many other expedients, including measures to reduce labor turnover, have been introduced and have brought results.

But the maintenance forces still need men, and while the measures already taken have helped greatly to alleviate the situation, they have not solved the problem. Its refusal to yield completely to the efforts that have been made to solve it has apparently created the impression in some quarters that it is insoluble and that nothing further can be done regarding it. But this need not necessarily be true. Ingenuity has a habit of solving the most difficult problems—sometimes in unexpected ways, as has been demonstrated time and again in the maintenance of way department alone, not to mention the other departments of the railways.

On at least one road, for example, the supply of labor available at a large terminal has been increased considerably by simply inaugurating a policy of paying the men on a daily basis. Apparently the prospect of getting paid at the end of each day's work has a strong appeal; the effect in this case has been to make available to the road all the maintenance labor needed at the terminal. Under the arrangement used, the foreman in charge of each gang is required to get in touch with headquarters by telephone early in the afternoon to transmit the necessary information for making up the payroll. This allows sufficient time to permit the payroll to be compiled and the necessary cash to be obtained, which is kept at the office of the labor agent where the men may call for it after quitting time.

This practice doubtless has disadvantages, but the important thing is that apparently these are outweighed by the advantages, this being indicated by the fact that the railroad concerned has expressed satisfaction with the results obtained. Admittedly, it has limitations that restrict it to a rather small field of application. Furthermore, it should be understood that in cases where steady employment is involved, that is, where hires are made for work which, at the time of hire is known to be of more than seven days' duration, this practice in no way exempts a railroad from rules which have been laid down by the War Manpower Commission—rules which require that all men hired have statements of availability from their previous employers, or referral cards issued by the R.R.B. or the United States Employment Service. This practice is cited here merely as one example of many other expedients that still may be adopted to alleviate the manpower shortage through refusal to subscribe to the thought that all the possibilities have already been exhausted.

High School Boys—

May Include Many Railroad Men of Tomorrow

FACED with a growing shortage in track labor as early as 1942, it was a fortunate thought that led a few railroads to investigate the possibility and practicability of interesting boys of high school age in track work. From a small start in that year, the employment of such boys gained impetus rapidly in 1943, until they were being employed widely over the roads of the country and, at the peak of the 1943 season, reached a total number estimated at approximately 10,000. Carrying the program still further during the current year, figures compiled by the Railroad Retirement Board show that between May 1 and August 1 the railroads had hired 20,700 high school boys, most of whom were still at work at the latter date.

No one contends that this large employment of teenage boys, nearly all of whom were without railroad experience at the start, has not presented special problems and called for special consideration in some instances, but, on the other hand, there are few who will deny that these same boys, as a whole, have turned out a large volume of essential work—work which, in the light of the scarcity of other labor, could not have been accomplished without their help. It is true that many of the boys have been unable to do as much work in a day as full grown, experienced trackmen, but it is due them to mention that many reports have been received indicating that their productive capacity and the quality of their work have approached or equalled that of many gangs of older men.

All of this has been of advantage to the railways—not to mention the advantages that have been gained by the boys themselves, which have been many. Every man-hour of boy labor, whether on the track or in bridge and building or water service work, has had its effect in building the outstanding record that has been made by the railways during the war to date. But is that the full return that the railways are to secure from these boys, now that most of them will soon turn back to their classrooms with the close of their vacation period? If it is, they will have overlooked a most important opportunity.

Important as has been the immediate help of the boys in completing essential work, there is a second factor in their employment that should not be overlooked, and that is the possibilities inherent in them as railroad men of the future. As pointed out in the Railway Age recently, who will say that in these hundreds of boys coming from all walks of life, the railroads may not find

many skilled trackmen, foremen, supervisors, roadmasters, division engineers, and even higher officers?

Never before have the railways had such an opportunity to recoup their war losses of former young employees and, of equal or greater importance, to reverse the trend of the last ten years or more, when fewer and fewer young men with higher education sought opportunities on the railroads. Many of the boys who have worked on the track, and in bridge and building and water service work as well, during the last summer, were attracted to this work, in part at least, by the same fascination of railroading that started many a career on the railroads in the past. With that innate appeal of the railroad industry as a basis, a few words by a foreman, supervisor, roadmaster or other division officer to at least the more promising of these boys before they return to school, suggesting the possibility of railroading as a life work, may plant seeds that will have a bearing upon the railroads in the future.

Supervision—

Needed Now More Than Ever Before

ONE of the features of the present shortage of labor that has not been discussed as much as its importance deserves is that of supervision. Alert maintenance officers have always recognized that adequate, intelligent and experienced supervision produces a larger return than almost anything else that the railways pay for. No matter how experienced and capable the men in a gang may be with respect to the work they are engaged in, the job will not be carried out with maximum efficiency or best results, unless there is someone to supervise it and co-ordinate the individual efforts of the personnel of the gang.

Examples of the widespread recognition of the value of supervision can be cited. No maintenance officer would consider the elimination of the section foreman, even where a skeleton gang includes only one or two men, because he must have some one in authority upon whom he can rely to look after the work, receive and carry out orders. In bridge and building work, small jobs arise continually that do not require the entire personnel of the gang. In such cases, the foreman detaches the necessary number of men and puts them under a "straw boss" upon whom he knows he can rely to oversee the men and the work and bring it to a satisfactory conclusion.

This has been the situation in normal times, when the gangs could be filled with experienced men who were familiar with railway practices. Today, in the majority of cases, the number of experienced men has dwindled, until the percentage of such men remaining is at an all-time low. Further, in addition to being inexperienced, the men who have entered the service in recent months are much older than those whose places they have taken. It must not be overlooked, also, that even the experienced men who are left are in the higher rather than the lower age brackets. In this situation the need for supervision is becoming greater.

Large gangs, such as those engaged in laying rail or ballasting, which are broken up into units that perform specific tasks, have always demanded a high order of supervisory and organizing ability, for they are mobile and every unit must progress at the same rate as the others. Even with a personnel that is experienced in the work, this high order of ability is required to avoid lost motion and to keep the several units moving forward, so as not to impede those that follow, without slighting the details of their work. With the labor that is available today, it is an almost impossible task if the supervision is placed on the basis of normal needs.

More supervision is needed, not only to co-ordinate the efforts of the gang or unit, but to teach the inexperienced men to do workmanlike jobs, and to do them with safety to themselves and their companions. This need cannot be ignored or put off by saying that the foreman and the regular assistant foremen should be more alert and exercise more care in handling the gang. This is obvious, but more than this is needed. In most cases the foreman is already overburdened, and his attention must be diverted from the details of supervision, so that he must rely to a greater extent on his subordinates, and they cannot be expected to work with the same effectiveness if they must also give individual attention to a considerable number of inexperienced men. Best results will be obtained in most instances by an increase in the supervisory staff.

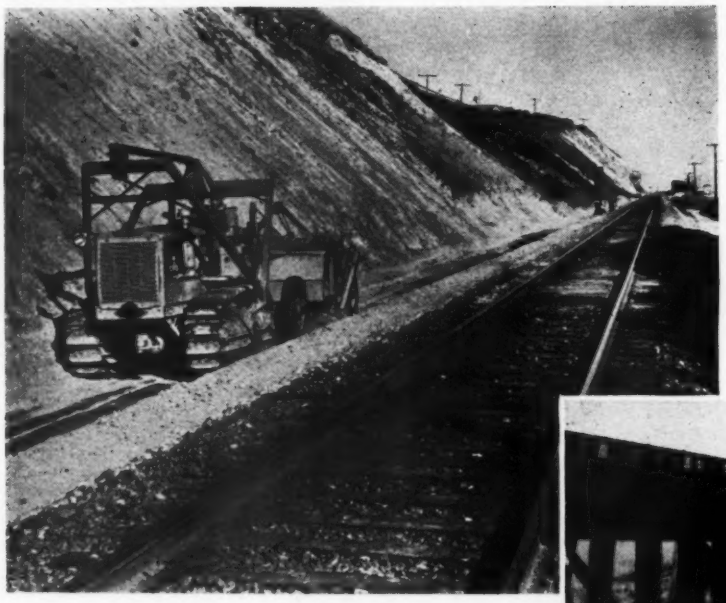
Freight Offices—

Modernization Warrants Greater Consideration

A FEW years ago stimulated by the advent of streamlined passenger trains, the railways awoke to the fact that a large proportion of their passenger stations were outmoded and unattractive. At that time they began to realize the value, from an advertising and public relations standpoint, of having modern, up-to-date passenger stations to complement this new equipment that was receiving such widespread acclaim. As a result, a considerable number of passenger stations and city ticket offices over the country have been rebuilt or renovated during the last decade in the interest of the traveling public, and much more of this class of work will be done in the future.

But while this development has been taking place, the railways have given little or no consideration to that important part of the public with which they deal over the counter in their freight houses. As a result, freight house offices, almost generally, continue to remain reminiscent of conditions 40 or 50 years ago. Recognizing the weakness of this situation, and that the good-will of shippers is at least as important as the good-will of passengers, a number of roads are beginning to give serious consideration to the appearance of their freight offices in both large and small towns, not overlooking the advantages of such improvements in greater efficiency of their freight house employees. Evidence of this is seen in what one road has done in repairing and modernizing two of its large freight house offices to make them attractive, which work is described in an article in this issue.

Surely, many more railways will see the advantage of similar work to improve the condition and appearance of at least those of its freight house offices where their representatives must deal with any sizeable number of shippers.



SOUTHERN PACIFIC

Adapts

Left—The Smaller Carryalls Are Used Widely for Side-Ditching Work. Below—The Filling of Trestles Is Another Task for Which the Carryalls Are Employed

MODERN company-owned grading equipment, principally in the form of crawler bulldozers and carryalls, but also including other types of machines, is now used widely by the Southern Pacific for all types of earth-moving tasks, from the smallest maintenance job to some of the largest improvement projects. The fact that the company now owns 33 crawler tractors of various sizes, all with dozer attachments, and 16 carryalls ranging in capacity from 3½ yd. to 24 yd., comprises a measure of the extent to which equipment of these types is now being used. Notwithstanding the progress already made in the acquisition of such equipment, there is a definite feeling on this road that its needs will not be satisfied until considerable numbers of additional units have been acquired.

The Southern Pacific's use of crawler tractors in maintenance work dates from 1924 when its first tractor was acquired, followed by a second unit in 1926. These tractors were acquired largely for plowing fire guards along the right of way, although it was recognized that other applications would be found for them. Two-wheel scrapers were obtained for use with these tractors, of a type that is dumped by a rope in the hands of the tractor operator. Eventually, both tractors were also fitted with dozer blades for general operation.

Tractor Purchases Reviewed

Additional tractors were not purchased until 1936, when the company acquired a Model 35 Allis-Chalmers and two Cletrac machines, one a Model 30 and the other a Model 35. In 1937-38, it obtained some second-hand Model 60 Caterpillar tractors, of which a total of five were subsequently acquired. Experiences with these early acquisitions were so satisfactory that a considerable number of additional tractors were obtained during the ensuing years, both for general purpose use and for hauling carryalls. Of the 33 crawler tractors that are now owned by the company, 25 are Caterpillars, including one Model 22, two 30s, five 60s, five R5s, two D4s, two D6s, one D7, six D8s, and one 75; two are Allis-Chalmers machines, one a 35 and the other an HD10; four are International-Harvester TD14s; and two are the Cletracs purchased in 1936.

Except for the two tractors purchased in 1924 and 1926, and the Model 30 Cletrac, all of the tractors were acquired with dozer-blade attachments. As already mentioned, the two original units were eventually fitted with such blades. The Model 30 Cletrac, on the other hand, was equipped with a front-end loader when purchased, the intention being to use this machine, in combination with dump trucks, for cleaning side ditches. Eventually, however, the front-end loader on this tractor was replaced with a dozer blade. At the present time about half of the crawler tractors owned by this company are used principally as power units for hauling carryalls; others are employed in combination with the carryall units to perform such tasks as spreading and shaping deposited material, pulling rooters and pushing the carryalls when loading; and still others are used for a wide variety of miscellaneous tasks.

It is hoped eventually to have sufficient crawler bulldozers to permit at least one to be assigned to each roadmaster on the road, of whom there are 61. The reasoning is that, in view of the high versatility of the bulldozer, there is sufficient work to be done on each roadmaster's territory, such as the plowing of fire guards, the restoration of the roadbed, the cleaning of cuts and a multitude of related tasks, to keep at least one of the machines busy practically all of the time.

A Bulldozer Saves the Day

An example illustrating the value of crawler bulldozers in emergencies is afforded by a recent incident on the Southern Pacific in which the availability of a machine of this type was an important factor in helping to clear a single-track main line following a derailment. In this incident, which occurred in mountainous territory, a locomotive was derailed by a slide as it emerged from a tunnel. At this loca-

Modern Grading Equipment To Many Railway Needs

Beginning in 1924, when it purchased its first crawler tractor, this road has gradually acquired a large amount of modern grading equipment, with special emphasis on bulldozers and carryalls. Taking its cue from grading contractors, the road has built up a complement of grading equipment comprising the most modern heavy-duty units, which are being used on the larger grading projects. Smaller units are employed on many routine maintenance and small improvement jobs

tion, the track is situated in a side-hill cut, and the slide, coming from above, caused the engine to be derailed in the downhill direction. To clear the track and to permit the engine to be rerailed, it was necessary to remove the slide material from the area between the locomotive and the uphill side of the cut. At the time of the derailment, there was available in the vicinity a quantity of heavy grading equipment owned by a contractor, but it was apparent that this was too large to permit it to be used and maneuvered in the space available. However, the company had available in this territory a D-4 Caterpillar tractor with a dozer blade, which was suitable to the task, but the problem was to get it to the site of the derailment, which was somewhat remote. This was solved by loading the tractor on two push cars drawn by a motor car and moving it to the site through the tunnel. So effectively did the bulldozer cope with the situation that a special push car has now been built for transporting it in the event of future emergencies of this nature.

In the late 'Thirties the Southern Pacific acquired its first LeTourneau Carryall, this being a 6-yd. machine that was obtained primarily for use in cleaning side ditches. In 1940, two additional machines of the same capacity were obtained, one principally for use in trestle-filling work and the other for ditching operations. Experience with the 6-yd. units developed the fact that they are somewhat too wide to be used with complete satisfaction for cleaning side ditches. With the thought that 4-yd. carryalls would be more adaptable to this class of work, two machines of this capacity were purchased in 1940 and two more in 1941.

Many applications have been found for these 4-yd. and 6-yd. carryall units. The cleaning of side ditches is probably the task for which they are most widely used, especially the 4-yd. machines. Other applications for which they are employed extensively include the restoration of embankments; the plowing of fire guards; the building of dikes and drainage ditches; the filling of trestles; the making of emergency repairs in the event of storm damage, such as washouts, washins and slides; and the grading work for small construction jobs, such as the building of industry tracks, new yard tracks and siding extensions.

These smaller carryalls had been in use only a short time when the company had occasion to become impressed with the possibilities inherent in the use of larger outfits on heavy grading jobs, especially with the economies to be derived therefrom. The occasion was the construction of a 30-mile line relocation on the company's San Francisco-Portland main

This Deep Cut Was Constructed With the Road's Heavy-Duty Grading Organization to Replace a Restrictive Tunnel

line around the Shasta Dam project of the federal government in Northern California. Carried out in extremely rugged country, this undertaking required the excavating of more than 5,600,000 cu. yd. of material, a large proportion of which was moved by means of carryalls ranging in capacity from 18 to 32 cu. yd.

A Solution to Tunnel Problem

This project was in progress at a time when this company was confronted with the problem of eliminating the operating restrictions presented by a considerable number of tunnels with sub-standard clearances, especially on its San Joaquin Valley line between San Francisco and Los Angeles. At the time these tunnels were built, the cost of moving earth was such that it was much cheaper to drive tunnels than to construct open cuts where the depth of the overburden was greater than a certain relatively low minimum. But the availability of modern grading equipment, such as carryalls, had brought about such a reduction in the cost of grading, as shown by experience with the equipment on the Shasta relocation and elsewhere, that the railroad was moved to give consideration to the possibility of replacing the tunnels with open cuts rather than enlarging them to afford standard clearances. Investigation proved that, using modern grading equipment, this would be the most economical solution in many instances and, furthermore, that the economies would be enhanced by doing the work with company forces and equipment.

Another factor in the situation was the probability that the company would find it necessary, over a period of years, to carry out numerous line-relocation projects for the purpose of reducing excessive curvature—projects in which grading would constitute one of the largest single items of work. Thus, in view of the large number of tunnel-elimination and line-relocation projects pending, it was decided that sufficient grading work was in sight to justify the railroad in establishing a heavy-duty grading organization of its own, to be built largely around carryalls of the larger sizes. Obviously, such an organization, either in whole or in part, would be available for other types of work, including maintenance operations for which it would be found suitable, and there would also be the advantage of having the equipment readily at hand, day or night, for use in such emergencies as washouts, slides and derailments.

Grading Organization Developed

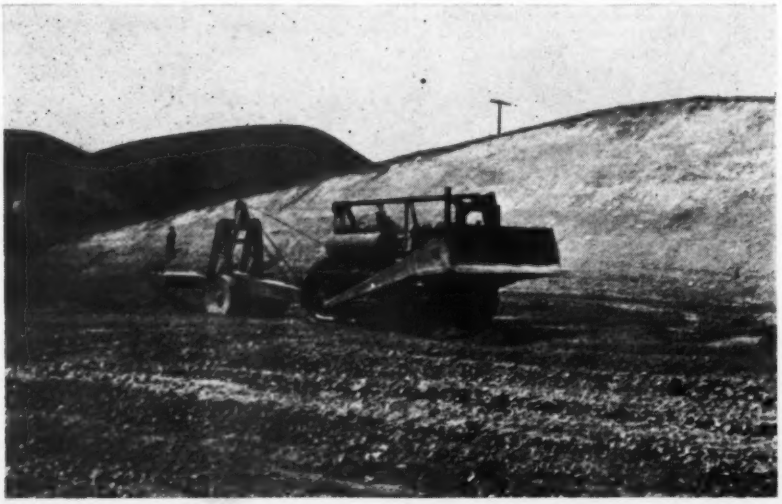
The first purchase of a carryall for heavy-duty grading work was made in 1940, when a second-hand 12-yd. machine was obtained. In the following year two additional carryalls were acquired, a new 12-yd. unit and a second-hand 8-yd. machine. In 1942, when the company undertook a program to eliminate restrictive tunnels by replacing them with open cuts, the grading organization that was used initially was built around the two 12-yd. carryalls, each of which was drawn by a Caterpillar D8 (95-hp.) tractor. It also included two other Caterpillar tractors, one a D-8 and the other an R5 (54-hp.), both equipped with dozer blades, the D8 being used principally for pulling a rooter and pushing the carryalls while loading, and the smaller R5 for the shaping and spreading work. Later, the 8-yd. carryall, drawn by a rented D7 (80-hp.) tractor, was added to the grading organization.

Further expansion of the grading organization was delayed somewhat by wartime conditions affecting the availability of such equipment, but in 1943 the company was able to obtain three additional large carryalls, including two 18-yd. units and one 24-yd. outfit, all drawn by D8 tractors. With these larger units available, the 8-yd. carryall was assigned to other work. To summarize, the principal units of the grading organization now include one 24-yd., two 18-yd., and two 12-yd. carryalls, all drawn by D8 Caterpillar tractors, and three bulldozer outfits, including one R5 and two D8 tractors, of which the former is eventually to be replaced by a D8 machine.

Other units of equipment in the organization include a rooter, a sheep's foot roller, a 315-cu. ft. wheel-mounted air compressor, a wagon drill, a 4-in. gasoline-engine driven centrifugal pump, and a sprinkling outfit consisting of a tank mounted on a motor truck. It is thus apparent that the outfit is a well-equipped, completely-integrated organization capable of performing grading work in an efficient and economical manner. For instance, in building embankments the material is placed and compacted in layers 6 in. to 8 in. thick, and, if it is excessively dry, it is well sprinkled to completely settle the dust and to obtain maximum compaction.

Personnel

As to personnel, the grading organization is comprised of 13 men, including an assistant engineer, who is assigned to the work as the man in charge; eight tractor operators, one of whom functions as the foreman; two additional operators whose function will be described later; and two mechanics, one a welder, who make any necessary repairs to the equipment. At the present time, the practice is to work the grading organization 10 hours daily, starting at 7 a.m. However, the two extra operators do not start work until 10 a.m., being engaged from then until noon in miscellaneous work and odd jobs, such as handling supplies or helping with repairs. During the noon hour, these men take over two of the Carryalls and operate them until the regular operators come back from lunch. At quitting time in the afternoon the regular operators leave their machines, with the engines running, wherever they happen to be. The two extra operators, who remain on the job until 8 p.m., bring the machines to a cen-



Tractor-Drawn Rooters Are Used to Loosen Material for Handling By the Carryalls

tral point where they fuel and service them, and in general prepare them for the next day's work. To expedite the making of any repairs that may require new parts, the road's purchasing department has issued a standing order against the nearest agency handling new parts for the equipment. When it is desired to move the grading organization to a new location, the required number of flat cars is ordered and the equipment is loaded by means of timber ramps.

Proving Its Worth

This outfit has already proved its versatility in railroad work and also its value in helping to restore train service rapidly in emergencies involving the obstruction or destruction of tracks or the roadbed. A review of its activities during a relatively brief period will serve to illustrate this point. The outfit had finished a tunnel-elimination job in Soledad canyon on the company's San Joaquin Valley line and had been transferred to Bakersfield, Cal., on the same line to do the grading for some new industry tracks. While the latter work was in progress, a washout occurred in Soledad canyon, and the outfit was dispatched to the site of the trouble to help in the restoration work. This job had just been completed when another incident occurred that required the attention of the grading outfit. This was a slide at Sacate, Cal., a point on the company's Coast line between Los Angeles and San Francisco, which required the handling of 13,000 cu. yd. of material. Following this work, the outfit was transferred to a line-change project on the same line.

Two Carryalls At Work on a Tunnel-Elimination Job

Loading a Carryall Outfit On a Flat Car For Transportation to Another Grading Job

The Southern Pacific now has a total of 16 carryalls. These include, in addition to the five large-capacity machines in the heavy-duty grading organization, one outfit of 8-yd. capacity, four of 6 yd., one of 5 yd., four of 4 yd., and one of 3½ yd. These are all LeTourneau Carryalls except the 5-yd. outfit, which is a Continental scraper, and the 3½-yd. unit, which is a McMillan machine. Like other types of work equipment, the carryalls are assigned on a system basis in order to assure that they will be used with maximum effectiveness and efficiency.

Other Off-Track Equipment

The increasing emphasis that is being placed by this road on the newer types of grading equipment does not mean that other types of off-track equipment, such as crawler shovels and draglines, are not being used to full advantage. Some of the tasks for which such equipment is being widely used include bank-restoration work, the changing of river channels, the construction of dikes in desert territory, the driving of piles, and many others. Draglines are being found especially useful for much of this work, with the result that increasing use is being made of these machines by the various railroads.

Nor is the company neglecting the possibilities inherent in the use of dump trucks for haulage work, especially in instances where a relatively long haul is involved or where the material to be handled consists principally of rock. In fact, it has acquired a fleet of 32 dump trucks ranging in capacity from 2½ yd. to 10 yd., of which five 10-yd. Diesel-driven trucks are assigned to a rock quarry. Used largely in connection with crawler excavating equipment, the trucks are employed on such work as the cleaning of cuts, the changing of river channels, the removal of slide material, and for a wide variety of similar tasks.

A recent example of the use of dump trucks was a tunnel-elimination job, involving a tunnel 711 ft. long, which was replaced by an open cut on a new alinement, entailing 18,400 cu. yd. of excavation, much of which was in solid rock. The grading organization used on this job included two 1¼-yd. steam shovels, six 4½-yd. dump trucks, a tractor bulldozer for keeping the roads in the proper condition and for spreading the material dumped from the trucks, and a compressor for furnishing compressed air for drilling, which was done with jackhammers.

The equipment discussed in this article is operated under the general direction of E. E. Mayo, chief engineer of the Southern Pacific, and F. L. Guy, engineer maintenance of way and structures, and under the direct supervision of R. B. Chapman, supervisor of equipment and welding, all of San Francisco.

Maintaining Water Service Facilities

Centrifugal Pumps—
How to Keep Them

By C. R. Knowles

Superintendent Water Service (Retired)
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THE development and improvement of the centrifugal pump in comparatively recent years has greatly enlarged its field of usefulness. As a result it is being used more extensively in railway water service. While the direct-acting steam pump probably still predominates both in number and in the amount of water pumped, it is being replaced rapidly by the centrifugal pump. Among the advantages of the centrifugal pump are its lower first cost, less maintenance expense and less floor space required. These advantages, together with its adaption to electric drive and automatic control, have contributed to its increasing use. It is not as flexible in operation as a direct-acting steam pump as it will not operate efficiently where there is a wide variation in the pumping head. It will not lift the water without priming or where the slightest amount of air enters the suction line, nor is it capable of handling water under high suction lifts as successfully as other pumps. Therefore, its use should be confined to fairly uniform pumping heads, and extreme care should be followed in its installation, operation and subsequent maintenance.

Description

A centrifugal pump consists essentially of a stationary casing, and an impeller which revolves within the casing. The impeller consists of a number of blades or vanes, either open or closed, and is attached to a shaft with which it revolves. The water enters the impeller at the center and passes out through the vanes of the impeller at its periphery. The velocity of the water is converted to pressure as it enters the casing and discharge. The pump may be either vertical or horizontal, depending upon the position of the driving shaft upon which the impeller is mounted. The vertical type permits the pump to be placed below the water level while the power unit can be placed at any desired level above the pump. Such a pump can often be used to avoid the deep pump pit required for a horizontal pump. Although single stage pumps are used most commonly, from two to six stages are not uncommon in horizontal pumps, while vertical turbine pumps are built with as many as 40 stages.

All centrifugal pumps are built to the same general principle. They differ, however, in construction and methods of operation and are classified by the Institute of Hydraulic Standards between centrifugal, propeller, mixed flow, and peripheral. Those in general use for railway water service come under the classification of centrifugal pumps and may be further classified as turbine and volute pumps.

Turbine pumps have circular casings and diffusion vanes surrounding the impeller, the function of the vanes being to reduce the velocity of the water as it leaves the impeller through gradually enlarging passages, thus converting the velocity head to pressure head and at the same time reducing the turbulence of the water and preventing eddy currents.

Volute pumps have no diffusion vanes, the casing being spiral in form (called a volute from which the pump takes its name). The volute permits the maintenance of a uniform velocity through the casing after the water leaves the impeller, thus serving essentially the same purpose as diffusion vanes in a turbine pump.

Characteristics

Unlike a reciprocating pump, a centrifugal pump must be designed for a fixed head and delivery to yield the best results. In railway water service, however, it is not always possible to avoid variations in the pumping head and while centrifugal pumps will operate against variable heads within reasonable limits, wide variations should be avoided and they should be designed to pump against the mean between the average high and low heads.

In planning an installation, special care should be exercised to avoid the operation of a centrifugal pump against a head so low that the rate of delivery will be greatly increased, because this may result in a waste of power and in overloading the pump and power unit. This factor is of special importance where electric drive is employed, since the motor can be damaged very easily by overloading. To overcome this possibility, a centrifugal pump that is to be driven by electric motors sometimes has an impeller of special design that will not permit the motor to be overloaded. It is sometimes possible also to change the impeller in a centrifugal pump to conform to changes in head or delivery. If the head varies within wide limits, it may be advisable to select a power unit large enough to carry the maximum load that may be imposed.

A single stage horizontal pump, handling up to 200 or 300 gal. of water per min. has a practical head limit of about 200 ft. when driven at 1800 r.p.m. If driven at twice this speed, the volume of the discharge doubles, the head quadruples and the power necessary to drive the pump is multiplied by eight. This relation applies to all centrifugal pumps, and if the head is beyond the reach of a single

No. 6 of a Series

This article describes the characteristics of centrifugal pumps, particularly turbine and volute pumps, and the uses for which they are best fitted. The troubles encountered most frequently in maintaining these types of pumps, and the corrective measures that should be employed, are also discussed in detail. Following articles will deal with deep-well and miscellaneous pumping equipment.

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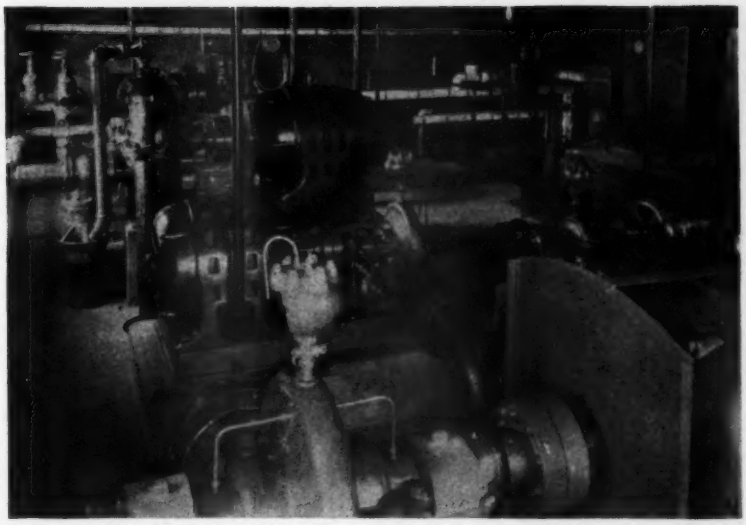
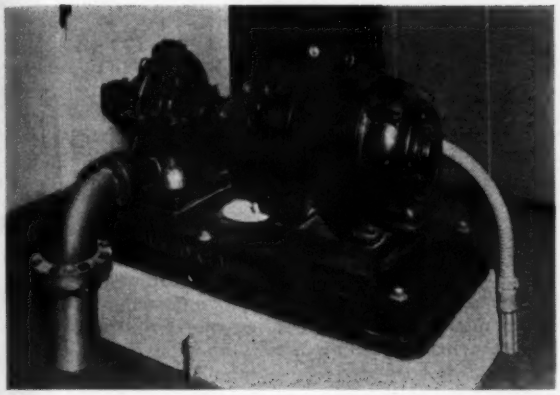
Operating



Above—An Installation of Large-Capacity Centrifugal Pumps



Left — A Typical Electric-Drive Installation for a Roadside Pumping Station

stage unit at 1800 r.p.m., it will be necessary to add other stages or increase the speed. Since the speed of an a-c 60-cycle motor can be increased from 1800 r.p.m. to only 3600 r.p.m., there is little choice as to speed of operation. This situation can be met very easily and economically with a turbine pump by merely adding more stages without change of speed, if pumping arrangements will permit.

Because of the relatively simple construction of the centrifugal pump, there is little to get out of order mechanically, if it is properly installed and operated. On the other hand, it is quite complex in some ways because of the principles involved in its operation. Unlike the displacement pump, it will not create a suction or lift the water unless the suction line is filled with water before the pump is started, and will not function if there is any air present, either from leaks or air pockets in the suction line.

Suction Cause of Most Troubles

It has been estimated that 75 pct. of the troubles experienced with centrifugal pumps may be traced to the suction side of the pump. If mechanical difficulties are eliminated, nine out of ten instances of trouble will be found in one or more of the following causes, all of which are suction failures and involve the delivery of water to the pump.

The pumper should be trained to know that correct priming is of first importance. Failure to fill the suction line and pump casing completely when priming will result in either reduced delivery or failure to deliver any water. All centrifugal pumps should be provided with foot valves and facilities for filling the suction line with water, except where the pump is submerged, as with a deep-well turbine. The foot valve should be maintained in such condition that it does not leak, and should have ample area to prevent undue friction, or about one and one-half times the area of the suction pipe. If a strainer is used, the inlet area of the strainer should be at least three times that of the suction pipe. If the suction line is installed properly and maintained in good condition, no difficulty should be experienced in priming the pump.

Air pockets may occur because of the suction line being laid to an uneven grade or with a fall to instead of from the pump, permitting the air pockets to form at high points in the line, or they may result from the use of regular taper reducers instead of eccentric or offset reducers. Air may also be introduced in the suction line where the suction inlet does not have sufficient submersion to prevent swirling eddies which may draw air into the suction line. The remedy is to lower the suction inlet until eddies do not form. Where air pockets are present, the pump may start with a full delivery which will gradually decrease or disappear. Air leaks may be detected by applying a flame to the joints or by applying pressure to the suction line.

If the suction lift is too high, the delivery may fall off or fail completely. After eliminating the possibility of air pockets or leaks in the suction line, the repairman should check the static lift, together with the friction loss in pipe and fittings. He should also look for obstructions at the suction inlet or in the pipe line. He may check the total suction lift with a vacuum gage and compare it with the static head to determine the presence of any obstruction or restrictions in the suction line. The total suction lift for a centrifugal pump should not be more than 15 ft. for cold water. Where hot water is handled, it should flow to the pump under a head. Water near the boiling point requires a positive suction head of not less than eight feet, while the pump is in operation.

Air leaks through the stuffing box on the pump shaft may also cause suction troubles. A well-maintained pump will always show a slight seepage of water between the shaft and the packing while the pump is in operation. This forms a water-seal and prevents air leaks through the

stuffing box. To correct leaks here, the packing gland should be adjusted or new packing applied and the water seal piping closely examined for possible stoppage.

Impeller Must be Kept Open

The impeller, if properly designed for the pump, will give the pumper little trouble and will probably outwear any other part of the pump except the casing, if it is not abused. The impeller openings will sometimes become partially or completely plugged where screens are not used on the suction inlet or where the screens are defective. Also, incrustation may form, especially where treated water is pumped, as the high speed of the water through the impeller will accelerate the precipitation of residual hardness after treatment. If the impeller openings are only partially closed, this will result in a reduced delivery of water and may cause an unbalanced condition that results in vibration. The wrong direction of rotation will also reduce the delivery or cause a total failure of the pump. This is not unusual with a new installation or where the motor is changed. To avoid this trouble, the water service repairman should check the rotation of the power unit with the directional arrow on the pump casing.

The repairman may sometimes overcome loss of pressure by using a larger impeller. This feature should always be checked with the pump manufacturer, both with respect to casing limitations and the possibility of overloading the power unit. Other alternatives are to increase the speed of the pump or reduce the friction losses in the piping. Where the head is reduced for any reason, the increased delivery of water may overload the power unit. The size of the impeller may sometimes be reduced. This also should be checked with the manufacturer before any action is taken.

The Water Service Series

Articles published previously, of which this is the sixth, include:

(1) Introduction (April issue)
(2) Sources of Supply—Streams, Lakes, Springs and Reservoirs (May)
(3) Sources of Supply—Wells (June)
(4) Sources of Supply—Pollution of Wells. Intakes, Suction Lines, Pump Pits, Ice (July)
(5) The Maintenance of Pumps — Reciprocating pumps (August)

Wearing Rings Take Up Wear

Wearing rings are installed for the purpose of taking up the wear between the casing and the impeller and can be replaced when worn to the extent that the efficiency of the pump is affected. They are sometimes attached to the impeller rather than to the casing. In some pumps, they are installed in pairs on each side of the impeller, facing each other, and one half being attached to the impeller while the other is attached to the casing. The latter type of ring prevents wear.

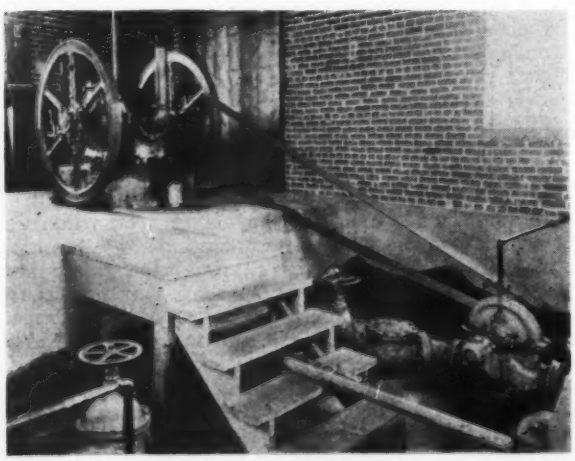
Worn or defective wearing rings result in a decreased delivery and pressure. They should be examined at regular intervals by the water service repairman and replaced when they show excessive wear or are otherwise damaged, for the efficiency of the pump depends very largely upon condition of the wearing rings.

The pumper should be cautioned against allowing a pump to run dry through poor priming or loss of suction for this will cause excessive wear and damage to wearing rings since the water acts as a lubricant between the rings and the casing or impeller as the case may be. Grit and sand in the water also cause excessive wear on rings and may necessitate more frequent inspection and renewal than in the case where clean water is pumped.

Correct Alignment Vital

The satisfactory performance of centrifugal pumps varies largely with the condition of the shaft. Of first importance, the pump and power unit shafts must be in perfect alignment. Some electric-driven pumps are built with the pump and motor on the one shaft and these pumps do not present any problems of alignment. Usually, however, the pumps and motors have separate shafts and are mounted on the same base. These are termed self-contained units. In still others, they are independent units mounted, in some cases, on separate foundations. In every case where flange couplings are used, the repairman should see that they are in perfect alignment in every way, for otherwise pump, motor and bearings will suffer damage with every revolution of the pump.

It is assumed that the pumping units are in correct alignment when they are installed, but after continued service the foundations may settle or the piping may set up strains in the pump that throw the shafts out of line. Flexible couplings will overcome the effects of slight misalignment to a certain extent but they cannot be expected to compensate for excessive conditions of this character. Pump settings should be checked occasionally by the supervisor of water service or repairman to see that no changes have occurred. In fact, periodic checking of alignment is an essential of good maintenance. The clearance of the moving parts is so close that a slight strain on the pump causes them to bind and cause damage and create considerable expense.

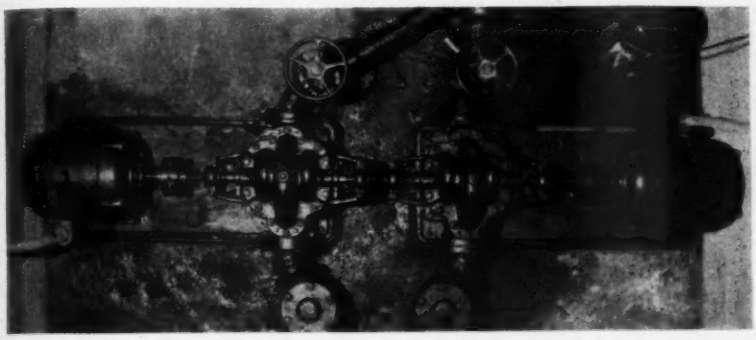


A Centrifugal Pump of About 500 Gal. per Min. Capacity with an Oil Engine and Belt Drive

Bearings Need Attention

Every experienced water service repairman knows that the bearings must be maintained in good condition if the desired efficiency is secured from the pump and damage or excessive wear is avoided on closely fitted parts of the pump, such as wearing rings, impeller and packing. Pump shafts are carried on sleeve or

ball bearings as a rule. Correct adjustment and lubrication of the bearings are essential to good operation and the life of the bearing. Improper adjustment of bearings is caused by bent shafts, misalignment, lack of oil or the bearing being too tight and is usually indicated by the bearing running hot. This not only damages the bearing but may cause damage also to other parts of the pump and calls for additional power. Badly scored or worn bearings and sleeves should be renewed before further damage results, although slight scoring may sometimes be corrected by refinishing the bearing with fine emery cloth.



A Duplicate Installation of Electrically-Driven Centrifugal Pumps in a Deep Pump Pit

Water service repairmen and pumpers should know that the correct lubrication of bearings is one of the first essentials of good maintenance. It must be remembered that they are high speed bearings and require special attention, particularly as regards lubrication. There is little danger of using too much oil on sleeve-type bearings, although the use of an excessive amount of oil results in waste and usually a dirty pump. However, an excess of grease on ball bearings will create friction and cause the bearing to become warm. The housing of ball bearings should not be packed more than two-thirds full of grease; half full is even better if the grease is applied with regularity at the required time. It should be remembered that the principal purpose of grease in ball bearings is to protect them against corrosion rather than friction.

No definite rule can be given as to how often pumpers should change lubricants, because of variations in operating conditions. It is good practice to change too often rather than not often enough, for oil is less expensive than new bearings, with their resultant delays and expense. The oil should never be permitted to become to worn or dirty before changing. Both lubricants and bearings must be kept absolutely clean and free from dust and dirt. The correct lubricants should always be used, preferably in accordance with the manufacturer's recommendation.

Water service repairmen should use extreme care in renewing sleeves or ball bearings, to avoid damage to the bearing and shaft. It is the best practice to force the bearing on or off by pressure rather than by hammer blows, if facilities are available. Pressure should never be applied to the outer ring of ball bearings, but always to the inner ring. If it is necessary to drive the bearings with a hammer, a driving sleeve or piece of pipe should be used so that the pressure will be uniform on the bearing. This is of particular importance when applying ball bearings.

Packing Should be Watched

The stuffing box of a centrifugal pump requires special attention by the pumper. Stuffing boxes on practically all horizontal centrifugal pumps are provided with a water seal, with the water usually brought under pressure from the pump casing to the center of the stuffing box. A lantern ring is provided which should be located in the exact center of the stuffing box so that the water will enter the box freely. The water serves both as a lubricant and to prevent air entering the pump.

It is easy for the pumper to fall into the practice of adding a ring or two of new packing when the old packing becomes worn, but this should be discouraged for it is poor economy and may result in a scored shaft and air leaks and may force the lantern ring out of position, and thus destroy the water seal. When it becomes necessary to apply packing, he should remove all of the old packing and apply new packing. Only packing suitable for the purpose should be used; under no circumstances should flax or hard packing be used. The pumper should exercise care to avoid getting the packing too tight, for it may cause loss of power or excessive wear or scoring of the shaft sleeves. The packing gland should be pulled up tight enough to force the packing into place and then released until a very thin stream of water flows from the stuffing box when the pump is in operation.

The water service repairman should use extreme care in applying sheet packing gaskets on split-case pumps and on suction flanges to avoid misalignment and air leaks. Gaskets for split case pumps must necessarily be applied in two sections. The packing must fit up snugly against the stuffing box so that there will be no possibility of an air leak into the casing. It should be trimmed close to the inner wall of the casing so that no packing will extend inside the casing to interfere with the flow of the water. Packing used on split casings should be of the correct thickness, for packing that is either too thick or too thin will interfere with the symmetry of the casing. Full face gaskets should be used on all suction flanges, as their use enables leaks to be detected and stopped more readily.

General Details

Where pumps are belt driven, the water service repairman should see that the pulleys are in correct line. Belts should not be too tight as this may cause unnecessary wear on the bearings and set up strains in the pump and piping.

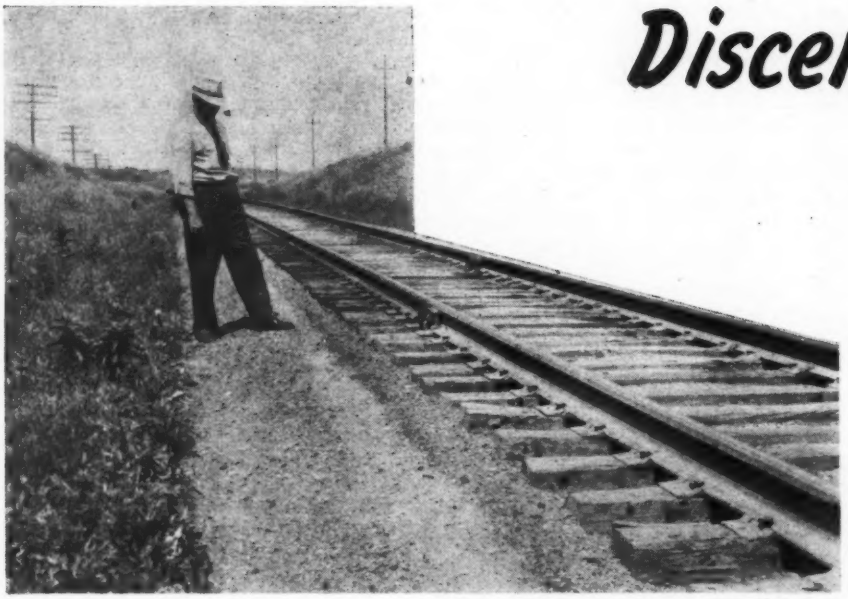
The suction pipe of a centrifugal pump should be ample in size, in order to reduce the friction as much as possible. The pipe should be at least as large as the suction opening of the pump; on long lines it should be a size larger.

Every pump should be provided with a check and a gate valve on the discharge, the check valve to prevent the water from draining back through the pump and to protect the pump from damage through surges in the discharge line and the gate valve to permit closing the discharge for repairs to the pump or check valve.

Although the cost of maintaining centrifugal pumps is usually lower than that of almost any other type of pump, they must be well maintained for the neglect of certain details of maintenance may cause a failure or loss in efficiency in a centrifugal pump, where it would not materially affect the operation of pumps of other types. Their satisfactory operation requires careful attention of both the pumper and the water service repairman.

Discers—

Keep the B



Supervisor Looks Over a Newly Disced Section of Main Line on the Iowa Division of the Illinois Central, Satisfied That the Work Done Will Promote Better Drainage and Improve the Stability of the Track

For many years the Illinois Central has made extensive and effective use of ballast discers in gravel, chat and cinder-ballasted track to stimulate free drainage, hold down weeds, and recondition the shoulder ballast section generally. This article tells of this practice, of the equipment that is being used, of the organization involved, and of the procedures that are followed under varying conditions

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TO promote ready track drainage and to control weed growth in the ballast section, especially where gravel, chats and cinders are employed, the Illinois Central makes effective use of ballast discers, a practice which is now of many years' standing. In fact, on each of a number of track supervisor's territories on which these types of ballast are employed, a discing machine is operated periodically throughout the year to keep the ballast in a free-draining condition and clear of vegetation. Ordinarily, the discers are not operated in rock ballast, which is cleaned periodically to remove fouling material or scarified from time to time between cleaning periods with a heavy-duty drainage car.

Discers Described

The ballast discers being employed on the Illinois Central are of the usual type, mounted on heavy-duty motor cars, and consist essentially of an overhead steel crossframe, two lateral disc-supporting arms, and two adjustable discing attachments, one for each arm, each including four discs. An additional attachment is a shaper blade which is dragged behind each set of discs during the final pass of the machine to dress the shoulder ballast back to standard shape.

The overhead frame, which is located toward the rear of the car, gives support to the discer attachments, which are raised or lowered to the exact position desired for discing, or raised to clear obstructions, by means of two separate cable and hoisting drum arrangements, one on each side. This frame also carries two safety cables, which are used to hold the disc attachments securely in a raised position, clear of all roadway obstructions, when the equipment is being run to and from the site of work, out of service.

The discing attachments themselves are essentially disc-mounting arms, each equipped with four discs, and each arranged so that the cutting angle and depth of the disc can be adjusted to suit the particular conditions encountered. The discs on the different machines are either of the gang type or individually adjustable, but in both cases they can be moved inward or outward on their mountings to cut at any point from the ends of the ties to the toe line of the ballast section. In deep or hard cutting, especially in the first pass of the discs adjacent to the ends of the ties, practically the full weight of the discer arms is let down into the ballast to produce the depth of cut desired. In the shallower cutting out toward the toe of the ballast section, tension on the arm-supporting cables holds the cutting edges of the discs at the particular level desired.

Method of Operation

Whether in gravel, chats or cinder ballast, and whether employed on main or branch lines, the operation of the discers is fundamentally the same, with the exception of the number of passes that may be necessary to bring about the results desired. This is illustrated on the various supervisors' districts on the Iowa division, where the discers are used more extensively than on possibly any of the other districts on the system, and where performance has been highly satisfactory. Here, a normal discing operation requires only two passes of a machine. In the first pass, the discs are set so that the innermost of the discs on each side cuts as close as possible to the ends of the ties, without striking the longer ties, and so that the bottoms of the innermost discs on each side cut to a depth of about two inches below the bottoms of the ties. With this same setting, the other discs on each side, which are spaced uniformly over a distance of approximately 20 in. on the discer arm, cut progressively lower to form a sloping drainage plane outward from the ends of the ties. In the first pass, the ballast is turned over and outward in a swath which extends from within about 3 or 4 in. from the ends of the ties to a point approximately 23 or 24 in. from the ends of the ties, and on a uniform bottom slope from a point approximately 2

Ballast Open
on the Illinois Central

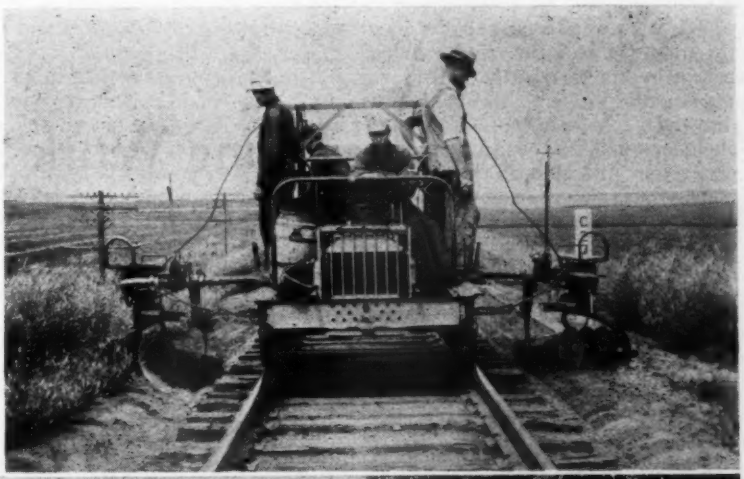
in. below the bottoms of the ties to a point approximately 4 in. below their bottoms.

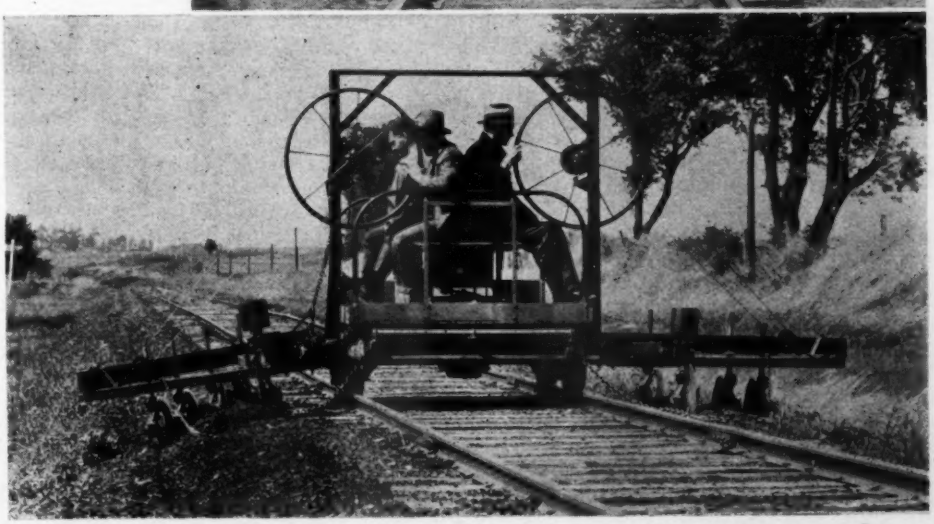
In the second pass of the discer, which is usually in the direction opposite the first pass, although not necessarily so, the disc group on each side is reversed in position to throw the ballast inward toward the ties, and is so set that the swath which it cuts overlaps the outer edge of the swath cut by the first pass, and cuts a toe line 60 in. out from the rail. In this second pass, the cutting plane of the first pass is maintained to promote ready drainage outward from the track, while the material in the outer limits of the shoulder is furrowed over and back against the ends of the ties. In this pass, the ballast plow or distributor attachment is dragged behind the disc group on each side and smooths the top of the ballast down to a uniform standard slope. Thus, in two passes of the discing machine, the ballast in both shoulders is churned up and turned over, opening up drainage, disturbing weed growth, and producing new uniform ballast toe lines.

The number of times that a discer is moved over any particular section of track depends upon local track conditions. Usually, a single pass of the discer is made over a territory early in the spring just ahead of the tie renewals, to turn the ballast away from the tie ends, and thus minimize the amount of shoveling necessary in connection with tie replacements. Following the completion of tie renewals, the second run of the discer is made, which churns up the outer limits of the shoulders, turns under any early weed growth, and lays the ballast uniformly back against the ends of the ties.

Under favorable conditions, the next and last pass of the discer in the year may be in the fall, when a light single pass may be made to cut the shoulder ballast away from the ends of the ties to encourage free drainage of the track during the winter months. Again in the early spring this ballast is turned back against the ends of the ties, to be cut away later just ahead of tie renewals and then replaced by the discers to restore the normal ballast section for the summer season.

While the foregoing operations are the usual operations under normal conditions, they are deviated from and supplemented by additional passes of the discing machines as conditions may require throughout the year. Thus, for example, with any tendency for the track to hold water or to pump following heavy or protracted rainfall, it may be decided to make a double run of the discers over the





Right Above—Discing Machine Making the Second Pass on the Main Line. Right—A Different Model of Discing Machine Engaged in Discing on a Branch Line

Road Crossings and Deck-Type Bridges Offer No Obstruction to the Movement of the Discers, Since the Discing Attachments Can Be Raised to Clear

territory involved. Likewise, an additional discing of the ballast may be called for by a tendency for excessive weed growth in the shoulders, a condition that is more likely to prevail in branch line tracks ballasted with cinders or gravel than in main tracks with a full ballast section of chats. In any event, the process of discing is rapid and effective, and brings about results that could be produced by other methods only at prohibitive cost in time and labor.

Where the track may become fouled with mud by local soft spots or side wash, care is taken not to work this material back into the shoulder ballast by out-of-face normal discing operations. Rather, this material is disced out as far as possible on the shoulder and is then disposed of, either over the side of the embankment or carried out of cuts. In some cases in the past, where the ballast has become fouled over a considerable stretch of track for any reason, a Jordan spreader has been used to cut down and waste the entire shoulder section—this being followed by reballasting with new ballast.

The Discer Crew

Operation of each discer requires a crew of three to five men on the discer itself, in addition to the men who are employed flagging ahead and behind. The discer crew includes an operator, who stays with the machine as it passes from section to section, and always two section men, who ride the deck of the car and operate the discing arm hoists. Sometimes two additional section men are employed in the crew to assist in raising the discer arms over obstructions such as signal pot heads, switch stand head blocks, road and farm crossings, etc.

Under normal conditions, an operating speed of three to four miles an hour is maintained, a faster speed having a tendency to throw the ballast too far outward or inward as the case may be. However, if it is desired to throw fouled ballast out from the shoulder as far as possible in connection with its ultimate disposal, a higher operating speed is maintained. Thus, under normal conditions of operation and not too great interference by traffic, each discing machine can disc from 12 to 15 miles of track a day. If only one pass of the discer is made, such as when cutting the ballast away from the tie ends in the spring ahead of tie renewals, the discers can cover as much as 20 to 25 miles of track a day, depending upon traffic conditions.

On the Iowa division, where section gangs are relatively small, two adjacent section gangs are employed in the operation of a discer in order to have available a sufficient force for the operation of the machine itself and to afford it adequate flagging protection. Each gang contributes men to the machine crew, while the remainder of one gang, with its motor car, affords head end protection, and the remainder of the second crew, with its motor car, affords rear end protection.

The gangs that start out with a discing machine in the morning usually stay with it throughout the day, even though the work may take them over one or two adjoining sections. This practice ties up two gangs for a full day, but precludes the disadvantages of disrupting the work of additional gangs, which would result if each gang accompanied the machine only over its own specific territory.

All ballast discing operations on the Illinois Central are carried out under the immediate supervision of the division engineers and track supervisors on the respective divisions of the entire system.

Doing Work Safely

By R. W. Hayes
Supervisor of Work Equipment, Chicago, Milwaukee, St. Paul & Pacific

TO THE EDITOR:

We are passing through a period of labor distress; that is, we have lost many of our younger men through the draft or for other reasons, so that we are now compelled to do work with gangs composed of men who have passed the years of greatest agility and of young men, most of whom have had no previous experience. All bridge work possesses some hazard, but under present conditions this hazard is increased unless the foreman is alert and his supervision is all-embracing. This throws an added responsibility upon him to insure that his work will be done without personal injuries.

As an indication of my conception of what a foreman can do to promote safety in his gang, I am presenting an imaginary case involving the replacement of two 35-ton plate girders with a span made up of two 50-ton girders. The instructions given by the foreman are also imaginary, but are made up of fragments taken from instructions I have heard given by foremen in preparation for starting similar work. While some of this may appear to be elementary, it seems to me that under present conditions, where some of our men have so little experience, a friendly reminder of what should be done and of what is expected of every man, is not amiss.

The gang consists of the foreman, an assistant foreman, two crane operators, six bridgemen and the work-train crew. The equipment consists of the work train, two locomotive cranes, an air compressor and the usual air tools, lines, hand tools and blocking. The bridge is on single track, on a 2-deg. curve having 3½ in. of superelevation; it crosses a stream at an elevation 25 ft. above the dry bed. The new girders have already been unloaded and set on blocking at the bridge site. The time is 7:30 a.m. and the gang and work-train crew are gathered around the foreman at the site of the work. The foreman is speaking:

"We are here to do a job that carries a large element of risk, but only as we are not alert and careful, for,

as those of us who are experienced know, with ordinary care this job is neither difficult nor dangerous. The men handling the work train know how to flag trains and how to operate their own train; both crane operators are experienced men who know much can be lifted safely at the various radii; and they know when their cranes are in safe operating condition. The assistant foreman has handled similar jobs many times and all of you have had some experience, while three of you are old-timers.

"Despite this, I believe that it is well for us to assign definite duties to each one, so that each of us will know exactly what is expected of him. While we can do our preliminary work now, we cannot cut the track until 10:15 a.m. This gives only a short time, but not too short, to complete the work and restore the track. You may rest assured that I would not cut the track if I did not consider that we have ample time to finish the job safely and satisfactorily. For this reason, I want each one of you to work at normal speed; do not hurry; there will be no need for it. As time passes, let me do the worrying about whether we are going to finish on time.

"Your tools should all be placed near the point where they will be needed. I do not want any of you to be running back and forth over the bridge looking for tools, ropes, blocks or other equipment, for this is one of the fertile sources of personal injury. Stay where you are and watch your footing, for it is 25 ft. down to the creek bed.

"Conductor, you will keep me advised as to the time we can start; this is now set for 10:15, but the train we wait for may be late. We will not start until you have two flagmen posted, one each way from the bridge, at the correct distance, with full flagging equipment and complete instructions. I must have a copy of the instructions. After you have cleared all trains, you will bring your train here to the bridge, made up as follows: the locomotive will be on the east, followed by boom car X928196, crane X106, crane X107, boom car X928197 and the caboose, in the order named. Spot crane X107, boom car X928197 and the caboose at the west end of the bridge, and crane X106 and its boom car at the east end. Then cut the locomotive and move it away a car length.

"Crane operators, make a complete inspection of your cranes, to include cables, clamps, clutches, lever and brake latches and all other items which will involve the safety of the men on the girders. Make all necessary running tests and each of you report to me the condition of your crane before 9:30. Mr. Watson (assistant foreman), you will appoint two men to set up the air compressor, place the hose and tools on the bridge in a safe way, to clear the rails and trains, and see that a running test of the air compressor is made; report the result to me by 9:30. You will also appoint two men to prepare the blocking to set the old girders on as they are removed from the bridge. This must be done by ten o'clock.

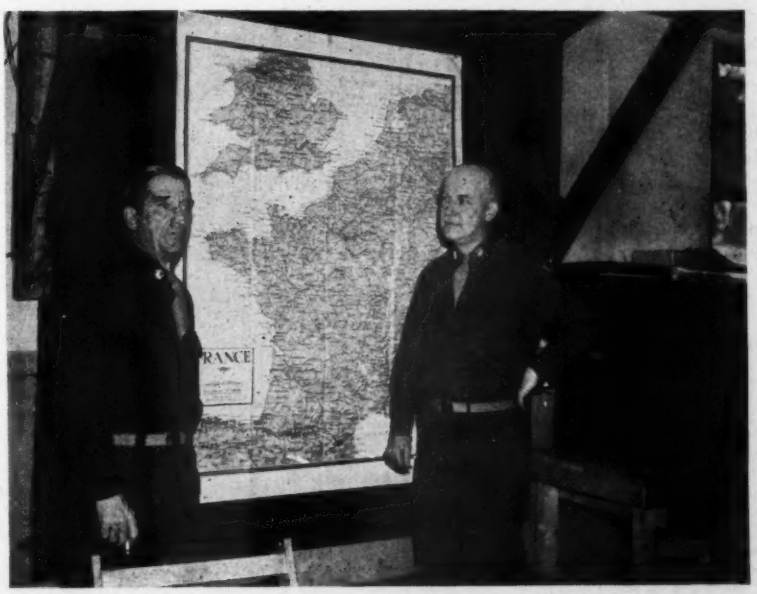
"We will have crane X106 handle the east end of the girders and crane X107 the west end. Since each of the new girders weighs 50 tons, each crane will lift 25 tons. It will be necessary to handle the girders on an 18-ft. radius from the center of the crane. Do not exceed this. You will note from the capacity chart that either crane will handle 31 tons safely at 18-ft. radius, but remember that we will be working on a curve that has a superelevation of 3½ in., while the lifting capacity shown on the chart is for straight, level track. Do not try to gage the radii; measure them with a steel tape from the center of each of the cranes.

"You will also appoint four men, Mr. Watson, two for each crane, to block the cranes after they have been spotted. Use good timber, well cribbed, and do not permit any of the blocks to rock; they must have a full bearing. Do not allow any lift to be made until I have had an opportunity to inspect the blocking myself and to check the boom radii. You will see that all tools are placed where they will be in easy reach. I want each man to inspect the tools he is to use, before 9:30.

"Remember that the assistant foreman is to give the signals and that you operators are not to accept a signal from any one but him. When everything is ready, but before any lift is made, I will inspect the hitch on the girder. The girder is then to be lifted about 6 in., held for 10 sec., and then lowered slowly into place as a test of brakes, clutches, rigging, etc.

"Another thing that I must know now—does every man feel well this morning? If not, say so. Sick men cannot handle a job of this kind. When the girders are lifted, I want every man to stand clear; the cranes do not need any help in lifting the girders. Each man, along with his other duties must also act as a watchman to keep spectators away. Each of you has time before the track is cut at 10:15 to study the job. Do this thoroughly.

"You may think that I am talking to you as one would to a bunch of school boys, and that it is silly for me to tell the conductor, who has had 30 years experience in train service, how to flag a train, or to tell you older men with your years of experience how to handle a job as simple as this one. Remember this, however, it is usually the over-confident old-timer who winds up in the hospital. In addition to the safety features of my talk, there is a definite advantage in every man knowing in advance what he is to do and when he is to do it."



Reading Maintenance Men See Action

Major Norman H. Schafer and Lt.-Col. Frederick W. Biltz, executive officer and commanding officer, respectively, of the Railway Operating Battalion, Military Railway Division, Office of the Chief of Transportation, ETOUSA. Both men served for many years with the Reading Company, of which Col. Biltz was engineer maintenance of way and Major Schafer was division engineer, both located at Reading, Pa.

Old Freight Can

Exterior View of Freight House No. 7, Showing the New Entrance

In connection with extensive repairs to two of its freight houses, the Chicago, Milwaukee, St. Paul & Pacific repaired and redecorated the offices in these structures with non-critical and salvaged materials to provide modern, attractive facilities for workers at modest expense

WHEN it became necessary to make repairs to the two-story office section of its freight house No. 7, at Milwaukee, Wis., and of its freight house at La Crosse, Wis., the Chicago, Milwaukee, St. Paul & Pacific decided to provide a more efficient arrangement of and to modernize the offices in these houses with non-critical and salvaged materials, thus affording attractive places to do business with shippers, as well as better working conditions for the general freight office employees.

In both freight houses, major repairs to foundations and floors were necessary, which afforded an ideal opportunity to rearrange office partitions and to modernize the interiors at minimum expense, along with other necessary repair and rehabilitation work. The work done at Milwaukee and at La Crosse will be described separately in that order.

At Milwaukee

Freight house No. 7 at Milwaukee is a brick structure 50 ft. wide and 812 ft. long, which was built in 1882. It is located on the southwest corner of Second and Fowler streets, and extends westward alongside and parallel with Fowler street. The two-story office portion 110 ft. long, is located at the east end, facing Second street. The old entrance was located in the center of the east end of the building, and immediately inside partitions provided a public hallway, beyond which was a cashier's office and a large general freight office. An agent's office was located in the far northwest corner, beyond the general freight office. A stairway near the center of the room provided access to record and file rooms upstairs.

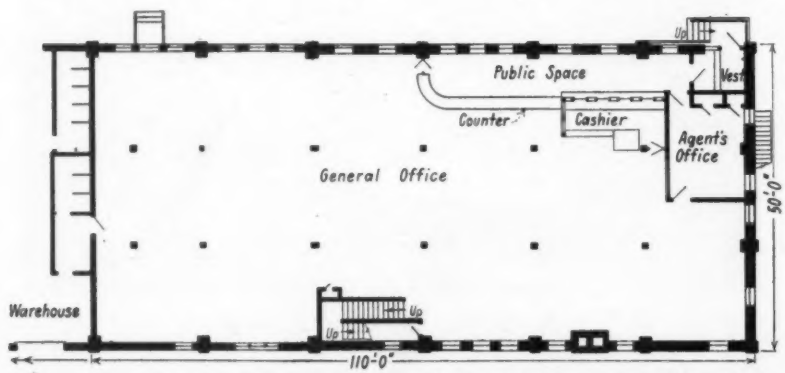
The office portion of this freight house was badly dilapidated on the interior and required major repairs. An old hardwood floor, which was supported on posts, was badly out of level and the wood sills were badly decayed. The old ceiling, which was formed by the exposed underside of the second floor, showed the floor joists, conduits, wiring steam lines, etc. This ceiling was suspended from roof trusses with hanger rods.

To repair the offices, it was necessary at the outset to install a new foundation and floor, and to increase the load-bearing capacity of the second floor. The need for these repairs presented an excellent opportunity to rearrange the offices and to modernize and redecorate them. This work was planned accordingly.

Rearrangement

The rearranged freight house includes a new entrance at the northeast corner of the building on the Fowler street side, facing the main business section of town. This entrance has a concrete landing and steps, with a handrail of welded second-hand pipe, painted grey. Above the landing a flat, modernistic canopy extends out from the side of the building. Immediately inside the entrance, there is a vestibule 9 ft. by 7 ft. in area, from which a door opens into a public space or corridor along the west side of the general office. This corridor is separated from the office by only a long counter.

The new office for the agent is



First Floor Plan of the Remodeled General Office of the Freight House at Milwaukee.

Offices Be Modernized Too

located coveniently at the front of the building, adjacent to and south of the vestibule, with a doorway from the east end of the public corridor. A large plate glass window in the partition forming the west side of this office allows a general view of the general office and a doorway in the south partition opens directly into this office. A new cashier's space is located behind the east end of the counter, adjacent to the agent's office, and a new stairway is located along the south wall, replacing the old stairway in the center of the general office space. A dumbwaiter was provided at the back of the new stairway for transferring records and files. In addition, old toilet rooms at the west end of the general office were renovated and new fixtures were installed.

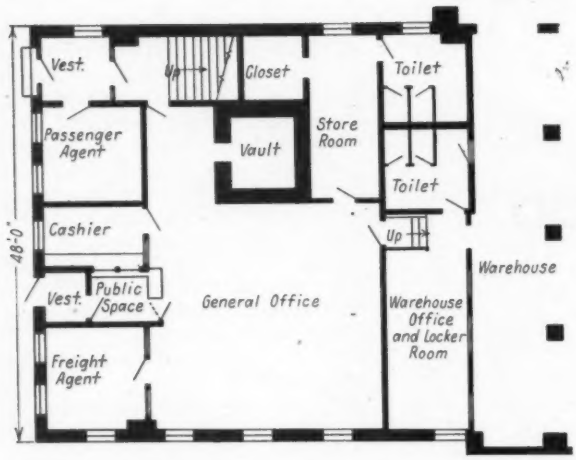
Repair Work

All of the old first floor of the office area was removed and was replaced with a new four-inch concrete slab floor laid on a two-foot compacted gravel fill. An asphalt tile floor covering was laid directly on the concrete, using a mastic underlay. To increase the load capacity of the second floor, second-hand structural steelwork was placed in that floor and was given support on 12-in. by 12-in. posts of untreated fir, placed on concrete foundations. A new suspended ceiling was placed about three feet below this old floor and 11 ft. above the first floor level, concealing all the wiring, pipes, etc., some of which had to be raised to make this possible. This false ceiling has 2-in. by 4-in. wood joists on 16-in. centers, and is hung from the second floor joists with 2-in. by 4-in. wood hangers. Its exposed face is covered with insulating lathe and plaster.

The interior faces of the brick walls were altered by removing the old baseboard plaster, lathe and furring strips, and replacing them with new 1-in. by 2-in. furring strips on 16-in. centers, to which insulating lathe and plaster were applied. All old window frames and trim were removed on the inside and were replaced with plaster returns with metal corner beads at the sides and above the window openings. New, narrow trim was then placed. This construction gives the window openings a much more modern appearance. Old beaded ceiling material on a partition at the west end of the general office was removed and was replaced with insulating lathe and plaster to match the other walls.

A boiler in a small basement under the southeast corner of the office area was removed and steam for heating the building was secured by making a connection to an existing steam line, from automatic stoker-fired boilers at a coach yard, located about 1,200 ft. to the west. The old boiler room in the basement was also renovated for janitor service and a new entrance to the basement was provided on the south side of the building, eleminating a former entrance on Second street. The removal of the boiler permitted a large office safe to be recessed in the south wall of the general office by conceal-

Right Above—Part of the Agent's Office in Freight House No. 7. Right—The General Freight Office



First Floor Plan of the General Office of the Milwaukee's Freight House at La Crosse, Wis.

ing it in the old, disused chimney.

Other improvements in the office include a modern electric clock on the north wall of the general office; a new loudspeaker system for use in the warehouse section; and provision for an electrically-operated water cooler for the drinking fountains, which will be installed when available. In general, the same radiation and lighting fixtures, of a modern design, were used, but were arranged differently.

Decoration

The general appearance of the office was greatly improved by the new asphalt tile floor, which is black and green, and by the new ceiling and the treatment around the windows. In addition, interior decoration and effective lighting provide a light, clean, attractive atmosphere which is aided substantially by the numerous windows on three sides. The walls and ceiling were painted cream color, while the trim was given a light varnish finish. In addition, all new or refinished oak office furniture was installed.

Worthy of special mention from a decorative standpoint are the counter, cashier's windows and agent's office. The long counter is open above, except at the cashier's windows. At its west end, the counter curves toward the wall and a low swinging gate provides entrance to the general office. The front of the counter, is faced with wallboard, painted black, and has pine trim at the top. The top of the counter is covered with dark green linoleum, with a black Farlite mold facing strip. The cashier's windows, at the east end of the counter, have horizontal bars of plate glass about four inches wide, and spaced about 1½ in. apart, instead of the usual metal grilles. This arrangement, with an attractive office in the background provides a friendly atmosphere in which the shipper can transact his business.

The agent's office has a red asphalt tile floor and black Farlite baseboard trim. Other features include a large mahogany desk, pictures on the walls, a built-in closet and lavatory, and drapes at the windows overlooking Second street and the large window overlooking the general office. In other respects this room is finished in the same manner as the general office. The furnishings and decorative treatment make this room unusually attractive, and its convenience to the front entrance of the office makes it much better than the old arrangement for transacting business with important shippers. To complete the improved appearance of the freight house, the outside brickwork was sandblasted and all trim was painted a dark brown.

The toilet rooms at the west end of the general office were completely renovated with new concrete floors and plaster walls. Modern lavatory and other fixtures were installed in the rooms and the toilet stalls were painted olive green.

In the warehouse portion of the freight house, 17 additional steel overhead doors, 14 ft. by 10 ft., were installed in the outside walls by removing brickwork in the panels between pilasters. The old doors were much smaller and were located in alternate panels on each side. These additional doors have greatly increased the loading and unloading capacity of the house.

On the south side of the freight house, the track centers were increased from 11 ft. 4 in. to 13 ft., eliminating a former hazardous condition. To do this it was necessary to cut off the roof overhang and to reduce the width of the platform along the south side of the freight house from seven feet to one foot. The original platform was of timber construction, supported on posts on concrete footing blocks. The new one-foot wide platform consists of timbers supported on concrete brackets built into the stone building foundation.

In addition to the above work, it is contemplated to install a pneumatic message-tube system operating between the offices of this freight house and another freight house located several blocks west.

La Crosse Freight House

The freight house repaired at La Crosse, of brick construction, is similar in style to that repaired at Milwaukee. This house, which was built in 1868, is 48 ft. wide by 211 ft. long. It is also located at a street intersection, with the two-story office

(Continued on page 807)

View of the General Freight Office at La Crosse. The Agent's Office Can Be Seen in the Left Background

Gangs Set Enviable Record in Rebuilding Long Burned-Out Bridge

This article describes how massed bridge gangs on the Missouri Pacific Lines in Texas and Louisiana, employing highly effective methods and equipment, rebuilt 72 panels of a 142-panel treated pile bridge, adequate for train movements, in 150 hours, completing the work later under traffic. Among the many features of special interest in this work, the article points out how a tractor-bulldozer was used most effectively in clearing away debris and for transporting materials for rebuilding operations

The Rebuilt Trestle—Note Series of New Fire Walls

BY employing massed gangs and equipment and round-the-clock operation, bridge and building forces of the Missouri Pacific Lines in Texas and Louisiana restored to service in 150 hours, a 142-panel combination open and ballast-deck pile bridge 26 ft. high, after a fire had completely destroyed 72 panels of the open-deck section in the highest part of the structure. Working from both ends, the driving of 290 piles 45 and 50 ft. long, was completed in 90 hours. This unusual record was made in restoring a structure on the Palestine, Tex.-San Antonio line of the International Great Northern unit of the Missouri Pacific Lines, about 12 miles southwest of Palestine.

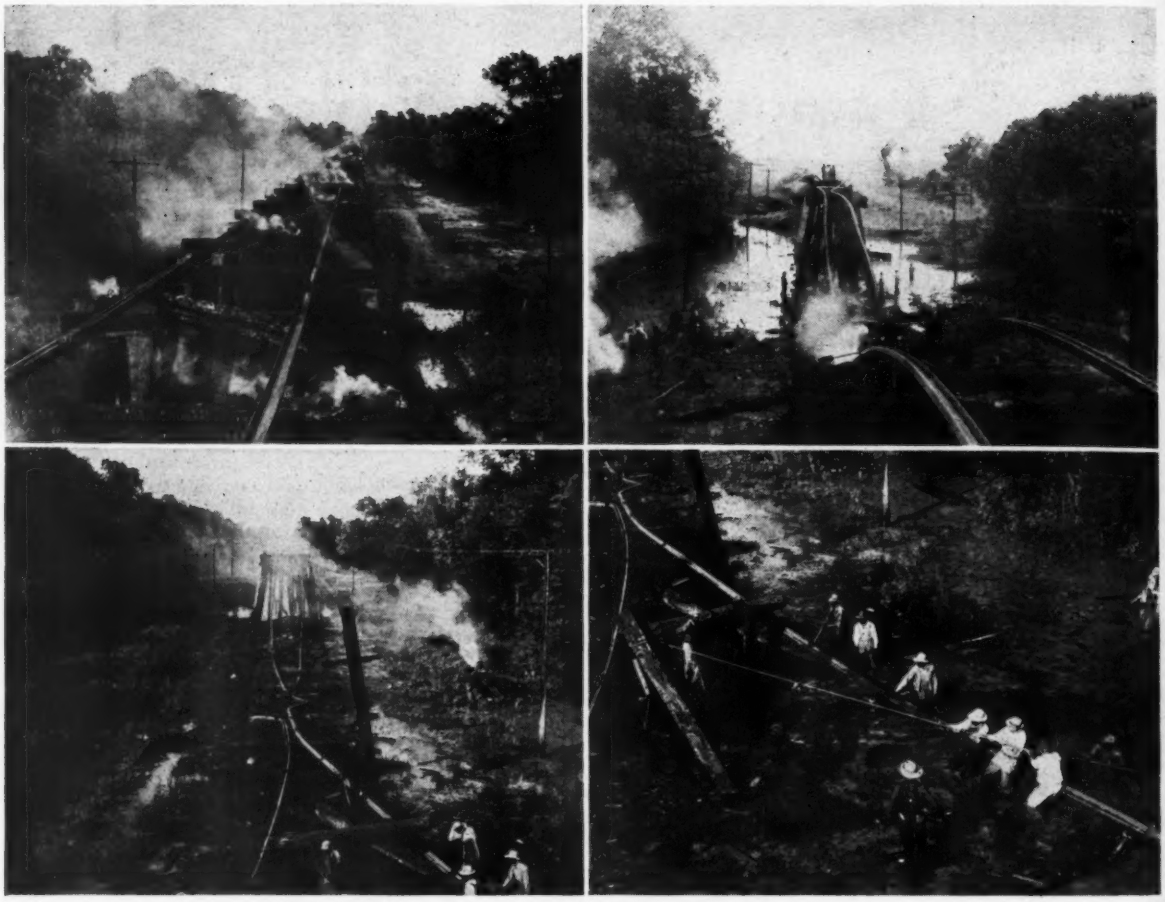
Adding to the significance of the speed with which the work was carried out, it required the bringing in of men and equipment from points as distant as 300 miles, and was done during a three-day downpour which raised the water to waist depth beneath a large part of the bridge and made a quagmire of the ground beneath most of the remainder. Furthermore, in spite of the magnitude and intensity of the work and the adverse conditions under which it was done, not a single personal injury was sustained by the forces involved.

The bridge in question, known as the Long Lake bridge, comprised 92 panels of open deck and 50 panels of ballast deck—all on six-pile bents on 13-ft. centers, and was constructed throughout of creosoted timber. Built in 1915 as an open-deck structure, with an overall length of 1834 ft., the bridge was in the course of being rebuilt at the time of the fire. The 50 panels of ballast deck had been completed a few months prior, and piles had been driven for the remaining new bents, looking to the replacement of the remainder of the deck at an early date. In addition, five new concrete fire walls had been constructed, but only one, directly at the end of the completed ballast-deck section, had been brought up through the deck level. The other walls had been built up only to the under side of the old deck, and their completion awaited the substitution of the new deck structure.

Rapid Organization for Repairs

The fire was discovered at 4:10 a.m., at which time it was burning both ways from the center, and had already enveloped about 40 panels of the open-deck section. With such a start, and handicapped by its inaccessibility to fire-fighting equipment, the fire was not brought under control until it reached the ballast deck section at the north end and the last 20 panels of open-deck at the south end. Between these points, 72 panels of the structure, including all of the new bents for the new structure, were completely destroyed.

Just as soon as word went out about the fire, measures were initiated for its rebuilding—calls being sent over the various lines of the road in Texas and Louisiana for materials, men and equipment. While nearby bridge and track gangs rushed to the scene, and while materials were being moved to the bridge on rented trucks and trailers from an emergency bridge storage yard at Palestine, in order to get the work started, 11 other bridge gangs started to the scene from points as distant as 300 miles. At the same time, two locomotive-type pile drivers were started to the site, one from a point 240 miles away, and the other over a detour route of 300 miles in order to get to the opposite end of the structure. Other equipment rushed to the scene included a couple of extra sets of power tools, a Burro crane, an American ditcher, electric lighting equipment, and an Allis-Chalmers 55-hp. tractor-bulldozer. All of this equipment proved indispensable, but, under the conditions that prevailed, the tractor-bulldozer was particularly effective in



Scenes During the Fire and the Early Stages of the Clean-Up Work Prior to the Rebuilding Operations

clearing away debris and in handling materials—working all the time in the bottom alongside the structure.

Here, after the pile driver was moved out into driving position, it was not backed off the structure until it had driven 52 consecutive bents, joining up with the work that was progressing meanwhile from the south end. This was possible, in large measure, by reason of the co-ordination of the work of the material cars, the American ditcher, the bulldozer, and the driver itself. As the driving progressed, all of the materials required, including piles, stringers, caps, bracing, ties, guard rails, bolts, rails and track fastenings, were brought out on the structure as far as possible and were lowered to the ground by the American ditcher. From this point they were moved ahead by the bulldozer, around and in advance of the work, where they could be picked up by the pile driver. The bulldozer dragged piles and rails ahead, but carried most of the other materials on the arms of its blade, taking as many as three or four stringers or eight to ten ties at a time, and all the while slushing back and forth in mud and water a foot or more deep. As successive bents were driven, the pile driver hoisted and set the caps, stringers, ties, guard rails and track materials, moving forward as quickly as conditions permitted, and leaving all bracing and finishing work for especially-assigned bridge crews behind.

At the south end, where more than 25 panel lengths of the bridge were in three to four feet of water, a different method of handling materials had to be resorted to. Here, of necessity, all materials were unloaded at the end of the bridge, and the pile driver had to move back to pick up and carry forward each successive pile. As each bent was completed, the Burro crane, for which a set-off had been provided at the end of the bridge, came into play. With the completion of a bent, the driver was moved back into the clear and the crane was rolled out onto the track and used to carry forward all of the materials necessary to build the fill-in panel of deck and track structure. Thus, alternating the use of the pile driver and the crane, the work was carried ahead progressively, but at a rate far short of that at the north end where the American ditcher and tractor-bulldozer kept the pile driver steadily supplied with materials and in constant operation.

In this manner, the work was carried out continuously in two 12-hour shifts. For night operations, electric lights were strung up on two temporary lines provided along and about 40 ft. from each side of the bridge. These lines were strung on telescoping pipe poles that form a part of each bridge gang's equipment, and which were forced into the ground at intervals of about 100 ft. These line lights were supplemented by extension cord lights run in to all points of operation and by floodlights mounted on the pile drivers and other units of equipment. Current for all line lighting was furnished by several portable electric generators, which also furnished power for all sawing, drilling and nut-running operations, and had much to do with the rapid progress of the work.

Final plans for the structure called for six-pile bents and a ten-stringer ballasted deck, but no attempt was made to attain these standards during the preliminary reconstruction operations. In these operations, the bridge was built with four-pile bents and an open deck with seven runs of stringers and a minimum number of

ties. Built to these temporary standards, pile driving was completed and traffic was resumed over the bridge about 90 hr. after the first driving was started. Subsequently, under traffic, more leisurely and with reduced forces, two additional piles were driven per bent and the open deck was converted into a ballasted deck. In this latter work, the piles driven previously were recut to the proper height and were recapped with the same caps, following which the open deck was replaced with a ten-stringer ballast floor, the track structure was ballasted, and all braces were adjusted to ballast-deck standards. This latter work was completed about two months later.

During the peak of the work of rebuilding the bridge, 12 bridge gangs, with a total of 70 to 80 men, and about an equal number of track laborers, were employed. Each bridge gang brought its own outfit cars, generally including a bunk car, a foreman's car, a kitchen-dining car, a tool car, two or three material cars and a water car. These cars were set out on available tracks in nearby towns and the bridge men, as well as all of the track forces, were taken to and from the job on motor cars or on hired trucks or buses.

The rebuilding of the Long Lake bridge was carried out under the general direction of C. S. Kirkpatrick, chief engineer, and R. E. Caudle, principal assistant engineer, of the Missouri Pacific Lines in Texas and Louisiana. Direct operations were in charge of Wendell Fields, assistant chief engineer, S. Beacon, assistant division engineer, and W. R. Miller, supervisor of bridges and buildings.

Old Freight Houses Can Be Modernized Too

(Continued from page 804)

end of the building facing south. It has two entrances on the south end, one of which, on the southwest corner, leads, via a small vestibule, directly to a stairway to upstairs offices. The other entrance opens into a main vestibule and thence into a general freight office on the ground floor.

Briefly, the ground floor provides space for several small offices across the front or south end of the building, including a freight agent's office at the southeast corner, the main vestibule, a cashier's office, a city passenger agent's office, and the vestibule for the stairway entrance. Behind these offices on the east side is the general freight office, 28 ft. by 26 ft., and a warehouse office and locker room, 9 ft. by 26 ft. On the west side, behind the front offices, are a large vault and the stairway, a storeroom and closet, and two toilet rooms.

The general condition of the office portion of this building was bad. It had a mud sill foundation which had rotted out and an old wooden floor which was as much as five inches out of level. In addition, the interior of the offices was reminiscent of many of the dingy features of 50 years ago, with wall facings of old beaded ceiling, old high desks and stools, a high ceiling and an old wood-faced vestibule.

Because of the generally poor condition of the offices, it was decided to renovate them completely at the same time that essential repairs were made, again avoiding as much as possible the use of critical materials. In this work, the plan of the building was not changed and no new partitions added, the only change made being the rebuilding of the entrances with modern doors and glassed-in vestibules, replacing old exterior storm entrances.

Repair Work

First, all the timber foundations were replaced with new treated mud sills and 10-in. by 10-in. posts. Since, the second floor and its partitions were supported from the roof trusses by hangers, rods were placed to stiffen the roof trusses, and this floor and its partitions were all raised as a unit to the proper level.

All the old interior trim was removed in the first floor offices, the ceiling was dropped about two feet, and new rock lathe and plaster were applied to the walls and ceiling, except in corners and at windows, where metal lathe was used. The floors were leveled, repaired and covered throughout with asphalt tile on a mastic underlay. The window openings were remodeled with plaster returns similar to those described in the Milwaukee freight house. In addition, all exterior windows and doorways were provided with new frames of the same size but of modern design, including narrow trim and horizontal three-light glazing. All wiring was repaired or replaced as necessary. The warehouse office and locker room behind the general office was given the same treatment and the old steel lockers were recessed into the wall. In the toilet rooms, concrete floors three inches thick were installed and about one-half the fixtures were renewed.

Large windows of opaque Band-Lite glass were installed in the partitions between the front offices and the general office, and two cashier's windows facing the main vestibule were fitted with barred glass similar to those described previously. Drawers and stationery shelves were built in under the counter in the cashier's office and under the counter separating the main vestibule and general office. Tariff cases were built in along the west wall in the general office, with the top sloped so that unsightly files and records can not be piled on top.

Decoration

The appearance of these offices was greatly improved and, in addition, the color scheme of floor, walls and furnishings adds greatly to their attractiveness. In the general office, the asphalt tile floor design is composed of grey and red squares with a brown border and a brown mop board. The plaster walls were painted a cream color and the ceiling an off-white. The windows have venetian blinds and their trim was painted light green. This room is furnished with new oak desks and chairs. The customers' counter facing the office has a brown linoleum top. The vault door has new trim painted light green and the door itself is painted to simulate a natural wood finish.

The agents' office is similarly decorated, except that the walls are painted Cascade blue and it is furnished with new walnut furniture. Other rooms, except the toilets, are likewise decorated and furnished much the same as the general office. The toilet stalls and walls were painted olive green below the partition height, and above this level the walls and ceilings were painted an off-white.

Outside the building a new concrete facing along the base was added up to the level of the bottom of the first floor windows. This base is 4 in. wide and is tied into the brick wall every 3 ft. by four ½-in. steel dowels 8 in. long. In the concrete these dowels were tied to a welded wire mesh used as reinforcing. Exterior improvements were completed by sand-blasting the brickwork, painting the exterior trim brown and placing new half-screens on all windows.

This work was done under the general direction of A. O. Lagerstrom, architect, of the Milwaukee. J. G. Wetherell, assistant engineer at Milwaukee, and I. C. Brewer, assistant engineer at La Crosse, were in charge of the work in the field.

What's the ANSWER?

Are Rail Braces Necessary?

Are rail braces necessary at turnouts? Would shoulders on gage and riser plates give the same results? Why? What are the relative advantages of adjustable and fixed braces?

They Are Necessary

By T. H. Beebee

Chief Draftsman, Chicago & North Western, Chicago

I consider rail braces a necessary requirement for a split switch. They should also be applied at guard rails, provided guard-rail clamps are not employed. Rail braces are not necessary for the turnout rails, provided milled-out plates or shoulder type twin plates are used back of the heel of the switch and up to the point where the clearance is sufficient to allow the application of standard tie plates. Properly-spiked tie plates, of either the single or double-shoulder design, will hold the lead rails in line.

Owing to the lack of clearance between the closed switch point and the stock rail, the latter cannot be spiked on the gage side. It is of prime importance, therefore, to restrain the stock rail against a tendency to turn over, in order to maintain correct alinement and afford a firm and rigid lateral support for the closed switch point. This can be accomplished best by the use of rail braces. Since the pressure of the wheel flanges is applied against the side of the rail head, the use of shoulders on gage or riser plates would be of no value in reducing or eliminating movement in the stock rail and switch point.

With respect to the relative merits of adjustable and rigid rail braces, the evidence is definitely in favor of the adjustable type. Under the tolerances allowed in the rolling of rail and in the forging of the rigid braces and riser plates, and taking into account the subsequent wear on these parts, it is not possible to secure and maintain a reasonably close fit between the rigid brace, the rail and the riser-plate shoulder. However, the adjustable brace can be installed to a snug fit and adjusted as required to maintain a satisfactory fit. The trend toward the more general use of the adjustable brace in lieu of the rigid brace in split switches is illustrated quite clearly in the drawings adopted by the A.R.E.A. in 1941. It will be noted that the number of adjustable braces is approximately one-half of the rigid braces recommended.

Must Have Rigid Support

By W. P. Cronican

Assistant Engineer, Illinois Central, Chicago

In considering this question it must be understood clearly that the turnout includes everything from the points to the frog, including the lead or closure rails. Braces are not necessary on the lead rails when the heel of the point is anchored to the main rail by means of a heel block, although in yard turnouts an occasional brace is sometimes used, because a locomotive just out of the shop is stiff and tends to crowd the closure rail immediately back of the heel of the point. This is overcome by the use of plates with milled seats, which is equivalent to the use of shoulder plates. These extend back to the point when the main and closure rails are separated enough to permit the use of standard double-shoulder tie plates,

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Send your answers to any of the questions to the What's the Answer Editor. He will welcome also any questions you wish to have discussed.

To Be Answered in November

1. *To what extent and in what ways can seasonal power machines and power tools be used in off-season work? What machines? What are the advantages? The disadvantages?*

2. *What repairs to a power-plant chimney are required most frequently? How should they be made? By whom? How should the chimney be inspected?*

3. *Under what conditions are flangeway fillers desirable for plank crossings? Under what conditions are they not desirable? Why? How should they be installed?*

4. *When framing bents for timber trestles on curves, should the superelevation be framed in the posts or formed in the bearing under the sill? Why? How should this be done?*

5. *Is it more desirable to tighten bolts in the fall, the spring or at some other time? Why? Does the weight of the rail or the volume of traffic make any difference?*

6. *Should a pipe line be laid to a uniform gradient? What are the advantages? The disadvantages? Does this differ for gravity, suction and discharge lines? Why?*

7. *Should section foremen be allowed to grind switch points, stock rails and frogs where welding is not required, or should this work be assigned to specially-trained men? Why?*

8. *In what ways can the dusting of concrete floors be overcome? How prevented in new floors?*

which are generally canted, to reduce the tendency of the rail to turn over.

I consider that braces in the switch itself are an absolute necessity. There is a distinct lateral shock to the switch rail when a locomotive or car enters the turnout because of the switch angle, so that, with the ever-increasing height of rail, the need for rail braces also increases. The old pressed-steel and malleable-iron braces are fast disappearing and have been replaced with heavier forged and cast-steel braces, now in almost universal use.

Fixed braces are hardly practical where milled seats are used, because of the tolerances allowed in rolling rail and the natural variation in forged or pressed braces. For this reason, as well as because of the finer adjustment demanded in the switches of interlockings, the adjustable brace is coming into more general use.

In most cases, shoulder plates are rolled and, therefore, are not adapted for switches, since each plate varies with the angle, the spread and, in some cases, the curvature of the switch rail. Plates with milled seats, or plain plates with welded or riveted stops, are therefore, used. In fact, this type of plate has now been made standard on most roads. The milled seats hold the rails in their correct places and relieve the spikes of some of their work, as they apply the lateral pressures to all spikes alike through the plate. In conjunction with the adjustable brace, the milled-out plate gives a rigid support to the rail and appears to be much safer than the older combination of a flat plate with a turned-up end to support the toe of the fixed brace.

The design of adjustable braces varies considerably, and there is room for improvement in most of them. However, the principle is the same in all of them and, if they have a snug fit under the head of the rail without applying enough pressure to lift the rail out of its seat, they will prevent the rail from turning over.

Must Resist Thrusts

By G. S. Crites
Division Engineer, Baltimore & Ohio, Baltimore, Md.

If turnouts were used only occasionally and then at low speed, for the diversion of train movements, rail braces could not be justified on economic grounds. However, turnouts are designed and used for diverging movements, some at considerable speed, so that provision must be made to resist the thrusts that result from the angular change in direction of cars and locomotives as they enter the turnout. Braces provide the only restraint for this horizontal thrust, which is applied at the head of the rail, and help the ¼-in. riser of the switch plates to prevent the base of the rail from sliding or working out on the plates. It should not be overlooked that from the point to back of the point of separation, the stock rail is not spiked on the inside.

Besides this, rail braces perform another function. It is important that the stock rail be bent or kinked to the angle of the point and that it be supported securely against all thrusts in front of the switch point. It is commonly assumed that these thrusts will all be outward but, as the wheels move into the point, a couple is set up in the stock rail, which throws an inward force in the rail ahead of the point, and this should be restrained by a rail brace on the inside of the stock rail ahead of the switch point. To make this brace really effective, there should be a brace opposite it on the outside of the rail.

Whereas the initial thrust is at the head of the rail, it requires heavy shoulders on the gage and riser plates to take the thrust that is transmitted to the base of the rail. Only enough braces need be used to counteract the head thrust. The braces on the straight side of the turnout need not be adjustable, but those on the turnout side should be adjustable to hold the stock rail in place positively and to take care of irregularities that cannot be overcome by one-piece braces.

Using Second-Hand Timbers

In view of the present shortage of lumber, to what extent is it permissible to use second-hand timbers for bulkheads at wooden trestles? What precautions should be observed? Why?

Does Not Favor

By A. L. McCloy
Supervisor Bridges and Buildings, Pere Marquette, Saginaw, Mich.

It is permissible to use second-hand timber for bulkheads, but only on branch lines, and the timber so used should be sound and of good grade. There is much to be considered in connection with the designation second hand, for there are several grades of material in this classification, ranging through good, medium, poor and what should be called scrap, the latter being fit only for cribbing in a washout or other emergency.

Bulkheads that are installed with a good grade of second-hand timber will last for several years, but if medium or poor grades are used, they will rot out in much less time and constitute a fire hazard which may result in complete destruction of the trestle and cause an accident to a train. Earth always is in contact with one side of a bulkhead and this facilitates decay. If a decayed bulkhead breaks out, particularly if this occurs at the bottom of the bulkhead, this will allow the earth from the embankment and the ballast to run out, leaving the ties at the end of the bridge without support, which might cause a broken rail.

For the reason given, bulkhead timbers are usually the first in the structure to rot, so that they should be of the best. Therefore, I do not favor using any but good timbers in backwalls or bulkheads, keeping in mind that this part of the structure is as important as any other part. Recently, we abandoned two branch lines and were able to salvage 75,000 ft. b.m. of second-hand bridge timbers, but I have not used any of this material for bulkheads. Instead, I drive two wing-wall piles and use 6-in. by 10-in. creosoted southern pine in lengths suitable for the requirements.

Not in New Structures

By General Inspector of Bridges

As a general practice, no second-hand timber should go into a new wooden trestle, whether it be of the open or ballast-deck type. We no longer use untreated material in our trestles, all timbers, including piles and bulkheads, being creosoted. As I view the situation, despite the present restrictions on construction timbers and lumber, it would be an unfortunate error of judgment to introduce into a new creosoted structure any material that would have a service life materially less than that of the remaining members. In fact, such action would violate every economic rule by which we should be guided in our construction.

I take the same attitude toward the use of second-hand material in all new wooden trestles, whether they are on main or secondary lines or on

unimportant branches. The amount of traffic is of less importance in this consideration than the life of the structure and the amount of maintenance that must be expended on it. For this reason, bulkhead timbers should be of sound material and well creosoted.

On the other hand, we have a considerable number of trestles that are approaching the end of their service life, which must be repaired from time to time until the full service life has been attained. Not a few of them have bulkheads that must be renewed if the structures are to be retained longer in service. This case presents a situation that is the opposite of that of new trestles, for it would be a foolish waste of money to replace the bulkheads in such bridges with new material that will outlast the remaining members. Under these circumstances I consider that the use of second-hand material is fully justified on the grounds of both economy and good maintenance. The timbers to be used should be sound and of a character, preferably creosoted, that will assure that they will function as long as they are needed in this application.

As I view the matter, the decision whether to use second-hand or new material should not be based on either scarcity or abundance of material, but solely on the principles that have been mentioned. If material for the remainder of the trestle can be obtained, it should not be more difficult to obtain the bulkhead material along with it.

What Minimum Stock of Ties?

Considering the importance of today's traffic and the existing shortage of ties, what minimum stock of ties should be carried on a section during the winter? What other considerations are involved?

Few Ties Used

By J. B. Kelly

General Roadmaster, Minneapolis, St. Paul & Sault Ste. Marie, Stevens Point, Wis.

Since the present tie shortage has been of such short duration, there should be no necessity for stocking ties to be carried on sections for ordinary replacements during the winter. Emergency ties to repair damage by accident are another matter. In general, such ties should be stored on cars or at terminals, ready for movement at short notice.

In viewing this problem over a number of years, it had been the custom on some roads to retain ties on sections for the purpose of replacing broken ties, but it has also been the experience of many supervisory officers that no ties were used for this purpose regardless of whether the track timbering was bad, fair or good. This includes sections of the country where the ballast generally remains frozen during the majority of winters, but may be affected occasionally by thaws that take the frost out deep and result in soft winter track.

Those roads that continue to follow the out-of-face method of renewals, creating a 100 per cent condition on some mileage and poor ties on some other parts of the line, would no doubt meet the temporary tie shortage by spotting in both cross and switch ties in an effort to stabilize the track. This, too, would also take care of a wide margin in the life of ties, since it is known that in an individual run of treated ties, there are years of difference in the lasting qualities of these ties. If any track has been allowed to become unsafe by reason of poor ties, it will, of necessity, have to be protected by carrying a varying number of ties per section in all seasons.

Favors an Emergency Stock

By W. H. Sparks

General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

From my point of view, there should be an emergency stock of ties on every section during the winter, despite the present shortage of ties that is facing the railways. All ties should be treated and, in general, most of the ties required for the ensuing year should be delivered during the winter and piled on the right of way as close as practicable to the point of use. There are several reasons why this is so. If the ties are unloaded at this time, the danger of creosote burns suffered by the men handling the ties is greatly reduced, and more ties will be unloaded per man-hour.

In the winter, and at other seasons as well, ties are needed at times when derailments occur that damage badly or destroy ties, and these must be replaced. I have heard some maintenance officers advocate the stocking of emergency ties at terminals or at division headquarters. It should be borne in mind, however, that often only one or two cars are derailed and that they can be rerailed by the train crew and section gang, so that it becomes unnecessary to send out a wrecking train. In such cases, the time required to get the emergency ties to the point of use is excessive. If the ties are available on the section, the track can be repaired in less time than it takes to ship the other ties from the emergency stock.

Again, it is clear that holding an emergency stock of ties on a section does not create any waste, for ties that are not used during the winter become available automatically for replacement purposes when the tie-renewal season opens. Furthermore, it should cost no more to unload and hold the ties for emergency purposes than to unload them for renewals, since the unloading must be done in any event and it can be done at less cost during the cold months.

Almost Imperative

By George Stafford

Section Foreman, Canadian National, Redland, Alta.

Under normal conditions the practice of keeping a stock of ties on each section during the winter for emergency use, was sound policy. Today, confronted with the dual problem of maintaining track in the face of increased wear and tear from a record traffic and of doing this despite a shortage of ties, it becomes imperative to carry such a reserve, to minimize delays when emergencies arise. Local conditions and the policy of distribution followed by the road will determine the size of this reserve stock. Roads that distribute their ties in the early spring, just in time for the renewal season, may insist on the minimum reserve that is believed to be safe, while those who ship ties during the winter are assured of a much more liberal supply.

In the former case, assuming the tie condition to be normal, 50 ties to the section should be sufficient. Where renewals have been curtailed to an appreciable extent, efforts to reduce the reserve to this low point is unwarranted and the stock should be increased to several hundred. However, I would recommend that as many ties as practicable be distributed during the winter, since nothing is lost by doing so. In view of the present man-power situation

any work that can be accomplished during the winter should be done, since this will release man-hours during the active season. Again, certain classes of cars are seasonal in their use, and those not required for winter service can be used for hauling the ties.

When Preparing Track for Winter

When preparing track for winter, what special work should be undertaken? When should it be done?

Drainage Is Important

By District Engineer

One of the principal requirements for good track during the winter and early spring, as it is in fact for any time of the year, is free and adequate surface drainage. For this reason, if it does not stand at the top of the list, it is not far below it, and should be given special attention. Side ditches should be clean, to standard section and on a uniform grade, to insure against standing water. While this work is under way, it should include the cleaning of vegetation and debris out of all lateral channels to make certain that culverts will not be blocked during thaws or heavy rains. Likewise, preparation for winter may or may not include subsurface drainage, especially where heaving gives trouble, but this work should be cared for early in the season, not as a last-minute project in preparation for winter.

Obviously, the track should be in the best possible surface, line and gage before winter sets in, but since this is a regular requirement throughout the year, it can scarcely be classed as a special preparation. However, gaging should not be deferred with the intention of making it a winter job, for removal and redriving of the spikes will damage the ties much more after they are frozen than if it is done before they are frozen. If there are places where the ballast is churning, the foul ballast should be cleaned or dug out and replaced with new material, for it is impracticable to keep smooth track during the winter months on ballast that has been churning.

While switches should be maintained to a high standard at all times, it is particularly desirable to make a special examination of them shortly before winter to make certain that all bolts are in place and tight, that all cotter pins are in place and that worn bolts are replaced. Ballast should be cleaned away from the switch rods and from under the rails from the point to the heel of the switch. Special attention should be given to adjustments to guard against lost motion between moving parts. Ample provision should be made for drainage to prevent the accumulation of ice after sudden thaws while the ballast is still frozen.

Should Be Done Early

By Roadmaster

Most of the preparation for winter can be and should be done well in advance of winter, for if it is not, the track forces are quite likely to be caught off guard by an early freeze following a rain, or by an early snow storm and a freeze. One of these jobs is the conditioning of highway crossings at grade. No supervisor should allow his foremen to start winter with crossings that need attention, for there is little likelihood that they will be able to give them the needed attention after winter is on them.

Drainage is an essential requirement for good track maintenance at all times. It is needed during winter thaws and when spring rains occur. Surface ditches in cuts, ditches at the foot of embankments and at the tops of slopes in cuts, as well as the channels of small streams crossing the right of way, should be cleared of all obstructions to insure free flow when water enters these channels. Washouts may occur where this is neglected. In hilly country it is also important that channels be cleared for some distance downstream from the culvert or bridge, especially if the stream is wont to bring down a large amount of silt and soil.

Obviously, line, surface and gage, as well as switches, should be as nearly perfect as practicable, although this is a year-round requirement. Yet the track should be in such shape that neither surfacing, lining nor gaging will be required until the frost goes out of the roadbed in the spring. As for switches, ballast should be cleaned from around the rods and from under the points to assure freer movement when the snow falls.

Conditioning Heating Plants

What special inspection should be made of heating plants before the advent of cold weather? When should this be done? By whom? What items should be given attention?

In the Late Spring

By Supervisor of Water Service

Heating plants, whether steam, hot water or the direct heat from stoves is the heating medium, should be inspected late in the spring or early in the summer; that is, as soon as they have been shut down for the summer. Repair parts normally require a considerable time to obtain and, at present, the time is increased considerably, so that it is desirable to get orders for them in at the earliest possible moment.

Fireboxes of steam and water plants should be cleaned and inspected; boilers should be washed and then given a hydrostatic test; smoke pipes, flues and chimneys should be cleaned and inspected for defects. Steam and water pipe should be inspected for leaks before the plant is shut down, and radiators and valves examined for leaks at the same time, as this will facilitate the later inspection.

After the inspection, steam boilers and hot-water systems should be filled with water to which plenty of soda ash has been added, since this will tend to inhibit corrosion. As an added precaution, after the boiler or system has been filled, the boiler should be fired and the water kept under heat long enough to expel all dissolved air. Where heat is obtained from stoves, the same thorough inspection should be made of grates, the firepot, the door and frame, the dampers, the stove pipe, the chimney and the stove pan or other protection to the floor.

Usually, the water service department is responsible, for steam and hot water plants and stoves come under the bridge and building de-

partment. The latter should examine and repair all flues and chimneys and the remaining work should be done by those who have jurisdiction of the maintenance.

Inspect Early

By C. R. Knowles
Superintendent Water Service (Retired)
Illinois Central, Chicago

Heating plants should be inspected at the close of the heating season, as well as before the advent of cold weather. As soon as possible after the plant has been shut down for the summer, it should be given a detailed inspection to ascertain what repairs will be required. This inspection is of special importance at this time when any kind of repair material is hard to get. There are also certain details of maintenance that can be handled better at the close of the heating season than later when the system is being prepared for service.

The boiler, the furnace and the smoke piping should be inspected thoroughly and cleaned as soon as the plant is shut down. If soot, flue dust and ashes are allowed to remain during the period that the plant is out of service, they will become incrusted and difficult to remove. Such accumulations also tend to absorb and hold moisture, so that they become the principal cause of corrosion.

Boilers should be washed as soon as they are taken out of service and refilled with water, unless it is possible to keep the interior of the boiler perfectly dry. A strong solution of soda ash should be added to the filling water to act as an inhibitor of corrosion. The boiler should then be washed and inspected again before it is put back into service in the fall. The fire box should be cleaned and inspected carefully, and the necessary repairs made to grates, doors, frames and brickwork. All insulation should be inspected and, if needed, put in good condition to prevent loss of heat. Steam traps should be cleaned and vacuum pumps overhauled and placed in good condition.

A second inspection before the plant is returned to service is desirable. At this time particular attention should be given to the radiators, valves, thermostats and the distribution system. Radiators should be cleaned and painted, if necessary, and accumulations of rubbish on and around the radiators should be removed, since they not only interfere with heating efficiency but also present a fire hazard. Special attention should be directed to radiator-control valves and air valves. The control valves should be examined to ascertain the condition of the seats and stems to prevent leaks and permit the desired control of the heat to be maintained. Missing valve-stem wheels should be replaced. It is also desirable to renew the valve-stem packing before each heating season, to facilitate the operation of the valves and prevent leaks. Air valves should be examined and adjusted.

Failure of the air valve to function is caused frequently by an accumulation of dust, oil and scale in the air vent. It should be remembered that the sole function of this device is to release any air that may accumulate in the pipe lines or radiator. Since efficient heating demands that they be kept in good operating condition, tampering with them by employees should be discouraged.

Where a vacuum system is employed, it must be kept air tight. The vacuum pump should be inspected and overhauled each season. Pistons and valve rods should be repacked, and valve seats, springs and stems should be placed in good condition.

Heating facilities generally are placed under the jurisdiction of the bridge and building or the water service department, but as a rule they are maintained by the water service repairmen, except in large office buildings, in stations at terminals, or at other points of concentrated heating requirements. In these cases repairmen may be assigned permanently or the whole plant and its maintenance and operation may be placed under the control of a stationary engineer.

How Long Should Runoffs Be?

In view of present train speeds, when raising track, what should be the maximum rate of runoff to allow trains to pass on tangents? On curves? At the end of the day? What considerations determine?

Conditions Vary

By W. H. Sparks
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

No more important subject can be brought up for the consideration of the forces engaged in track and bridge maintenance in these days of high-traffic density and generally high train speeds. It should be constantly in the minds of men who are in charge of or engaged in raising track. There are three points to keep in mind—the avoidance of delays to trains, the safety of their passage and the time involved in making the runoff before arrival of a train.

This problem is simpler on some roads than on others, for on some of them every general raise is carried out under the protection of slow orders or the display of slow boards, in either of which events all trains must slow down to a predetermined speed. Where this is the practice, the runoff can be short and not as much care is demanded in smoothing it up as when trains do not reduce speed. However, one essential requirement of a runoff, regardless of train speed, is that it shall be level and tamped solidly enough so that it will not become out of level during the passage of a train. In other cases, all trains are scheduled, so that the foreman knows well in advance when to make the runoff and can take ample time to do so. This is particularly advantageous where inexperienced men are employed, for it requires more time for preparation than when experienced men are available.

On some roads, only passenger trains and particularly important freight trains are scheduled. In this event, the foreman must be particularly alert, even though in possession of a line-up, and must protect himself by flagging. Under this condition, runoffs sometimes are not as well prepared as they should be. Where the line is full of curves, it is essential that train speeds be reduced while passing surfacing gangs, for an irregularity that would cause no trouble on a tangent may be extremely hazardous on a curve, particularly if this irregularity is in the cross level. Wherever the view is obstructed, no heavy lift should be made, except under the protection of slow orders, slow boards or under authority of the dispatcher, obtained by means of a portable telephone set.

Now, as to the length of the run-

off. If the raise is one inch, a runoff two rails in length should be sufficient; for a lift of two inches the runoff should be three or four rail lengths for high speed; while a runoff for a three-inch raise should be not less than four or more than five rails long. This should be the maximum length, for if a higher lift is necessary, it should be made under slow orders. It is essential that all ties be tamped solidly to prevent damage to the rail, and that the rails be level. More than one train has been derailed on runoffs that were not level.

The requirements for runoffs on curves do not differ from those on tangents, provided the elevation is maintained without irregularities. Runoffs that are to be left overnight should receive somewhat closer attention with respect to the tamping of the ties, but they need be no longer than has already been outlined. However, the unsurfaced track ahead of the runoff should be checked carefully with the track level. If the track is out of level, it should be leveled carefully for at least five rail lengths ahead of the runoff before the work of the day is ended. In other words, the track should be in condition for full speed.

Depends on Lift

By W. Woolsey
Section Foreman, Illinois Central, Chicago

The length of runoffs should be in constant ratio to the height of the lift, up to a raise of, say, three inches. This rate should be one rail length for each inch of raise. For example, for a raise of 1 in. the runoff will be 39 ft. long; for 2 in., 78 ft.; and for 3 in. the length should be 117 ft. However, if trains are to pass at full speed, there is no danger that the runoff will be too long, but it can easily be made too short by paring down on the lengths stated. For high speeds the runoff rate should be ½ in. to 39 ft. Short runoffs always carry the hazard of bent rails and insufficient tamping.

It is seldom practicable to prepare a runoff for full speed when the raise is more than three inches, for which reason higher lifts should be made under the protection of slow orders. Always remember that it is far better to flag a train than it is to let it over a poorly-prepared runoff. Keep in mind also that the train must not only get over the runoff, but that it must do so safely. Every poorly-prepared runoff is an obstruction to train movements and carries the hazard of bent or broken rails.

All runoffs for overnight use should be prepared carefully with the use of the level board and careful tamping inside and outside, with the ballast dressed. Never leave the track open. The reason for this latter precaution is that if a rain occurs during the night and continues the following day so that the gang cannot work, the track will remain safe.

Sedimentation in Pipe Lines

What methods can be used to prevent sedimentation from treated water in water lines between pumps and storage tanks? How can such sedimentation be cleaned out most economically?

Now Only a Minor Trouble

By C. R. Knowles
Superintendent Water Service (Retired) Illinois Central, Chicago

As a rule, little trouble is now experienced because of sedimentation in pipe lines carrying treated water. However, the treating plant must be designed and operated in a way that will prevent sedimentation. The principal requisites in the prevention of sedimentation, and incrustation as well, from water treated by the external method are adequate reaction and settling time, together with effective sludge removal. The use of filters is a positive preventive, and will reduce after-precipitation.

There is a definite distinction between sedimentation and incrustation. Sedimentation is the deposition of suspended matter in the form of sludge or mud by mechanical means, while incrustation is the deposition of the matter in the form of a crust or scale, through chemical reaction, as the matter passes from solution to suspension.

Undoubtedly, the velocity of flow through the pipe line has an effect upon the form of the precipitate. High velocities prevent the deposition of the suspended matter in the form of mud or sludge, but tend to accelerate incrustation where the matter in solution passes to suspension, with after-precipitation. On the other hand, low velocities permit the matter thrown into suspension to settle out and accumulate as sludge.

If the water is treated by the internal method, in which the chemicals are applied as the water enters the pipe line, there is some possibility of deposits in the pipe line, since the reaction is not complete until the water enters the boiler. For this reason, suspended matter carried by the water, plus that which is thrown out of solution as the chemical reaction continues, may be deposited in the pipe line under certain conditions. This may occur at low points in the line and when the velocity of flow is too low to carry the suspended particles along. Thus, maintenance of correct velocities will do much to prevent sedimentation and incrustation, in either the external or internal method of treatment.

Sediment can usually be removed by flushing the pipe line or by reversing the flow. Blowoff valves should be provided at low points in the line or elsewhere where these deposits are likely to occur. If the sediment has been allowed to remain in the line until it becomes caked and hard, there is no other recourse than to clean the pipe by mechanical means, using scrapers to dislodge the caked deposit from the pipe.

Mentions Several Methods

By H. C. Donovan
Assistant Engineer, Chicago, Milwaukee, St. Paul & Pacific, Chicago

Sedimentation or deposition of scale in pipe results from an unstable condition of water after chemical treatment has been applied. This is traceable to excess treatment, which permits a continuation, in retarded degree, of the chemical reactions, resulting in a carbonate precipitation.

Several methods have been employed to retard this after-precipitation. The finished treated water may be recarbonated, which converts the insoluble normal carbonates of calcium and magnesium to the very soluble bicarbonates. In addition, the carbon dioxide converts the excess lime into bicarbonate. Another method is to apply an inhibiting acid treatment, and this has been effective. This changes the insoluble carbonates to soluble sulphates or chlorides, but an excessive volume of carbon dioxide is formed, which is difficult to remove. However, both methods result in an increase in the hardness of the treated water and a decrease in the pH valve,

which will encourage corrosive tendencies.

Still another method is to introduce a tannin treatment to the finished treated water, bringing about a colloidal condition that retards the carbonate accumulation in the pipe lines. It is believed that a property of the tannin enables it to retain the carbonate in an amorphous form instead of the crystalline form.

In recent years a new method has been developed, using a complex phosphate which is added to the treated water in minute quantities, ranging from 1 to 3 parts per million, depending on local conditions. Tests on this material have indicated, in some cases, that it will gradually remove incrustation already present in pipe lines.

The most common methods are the latter two, either singly or in combination. Satisfactory results have been obtained by using a tannin treatment with the phosphate addition. In addition to preventing incrustation in the distribution lines, this treatment tends to prevent scale formation in locomotive injectors, branch pipes and boiler checks. The coloring of the water is not objectionable if it is to be used only for boiler purposes.

By reason of better control of excess treatments in recent years in lime-soda ash plants, as well as the application of tannin and phosphate to the finished water, the incrustation of pipe lines has been retarded considerably. If a pipe line is incrusted to the extent that pumping costs are excessive, or pump capacities are reduced, the decision as to the best method to overcome the difficulty should be arrived at carefully. Local conditions will prevail in deciding whether it will be more economical and practical to replace an incrusted pipe line or to clean it by mechanical or chemical means.

The length of the pipe, its condition, the depth it is buried, the type of pipe and joint material and the design must all be considered. Mechanical pipe cleaning equipment is available which will do a satisfactory job. Chemical cleaning may be used advantageously in a line that has many bends, as well as in long straight runs. The old proverb that an ounce of prevention is worth a pound of cure is true in this case as as it is in many others.

Can Bridge Ties Be Resawed?

In view of the shortage of lumber, to what extent is it feasible to resaw ties released from bridges for other uses? Other timbers? What uses?

Finds It Feasible

By L. G. Byrd
Supervisor Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

For many years it has been our practice to use only creosoted ties on open-deck trestles and steel bridges. It has also been a regular practice to salvage all of the sound timber in ties removed from bridge decks, as well as other timbers, such as stringers, caps and, in framed structures, the posts and sills. Today this is a particularly live subject with us. Our ties are 7 in. by 8 in. by 9 ft.; 8 in. by 8 in. by 10 ft.; and 8 in. by 12 in. by 12 ft., and when it becomes necessary to renew the entire structure, or certain parts of it out-of-face, we find very few pieces that will not yield some sound material for reuse in repairing buildings, platforms, bulkheads to trestles and small drainage boxes for highways and under tracks carrying light traffic.

About 14 years ago we constructed a large number of box culverts, 2 ft. by 3 ft.; 3 ft. by 3 ft. and 4 ft. by 4 ft., under one of our light-traffic lines, all of them made of second-hand ties that had been removed from bridges after they had given 20 or more years service in their original application. A recent inspection disclosed that these boxes are all in good condition and should last for an indeterminate number of years.

This material was not suitable for reuse as ties because it was rail cut. However, they were sawed between the rail seats into lengths suitable for the roofs and floors of the culverts. We have also constructed boxes as large as 5 ft. by 6 ft., of second-hand ties, for highways, and these have now served 14 years and are still in good condition. The short ends were used for footing blocks under small buildings and platforms. All cut surfaces were treated with hot creosote and tar. We have also resawed ties 8 in. by 10 in. by 10 ft., reducing them to 7 in. by 8 in. by 9 ft. for reuse on trestles on lines of light traffic.

In several instances, large dimension ties have been resawed for use as studding or have been milled into 2-in. by 4-in. pieces 10 to 12 ft. long, and into 1-in. boards which were used for general repairs on small buildings.

Both treated and untreated ties, when they are released, generally will yield from 70 to 90 per cent of sound material, and this should be salvaged under normal conditions. Under present conditions it is almost imperative that this be done. On my division, we have saws that will cut timbers up to 20 in. square, and we are able to get a large quantity of usable boards from this mill.

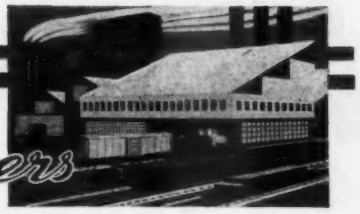
Is Well Worth While

By Building Inspector

This is a subject that, in the past, has seldom been given the consideration that its importance deserves. Long ago, on the road with which I am connected, every division had a small carpenter shop in which lumber was precut for use and in which considerable second-hand material was worked over for reuse. Our management succumbed to an "economical" streak, however, and abolished these shops. The general manager, who had no background of engineering or maintenance, took the position that lumber was too cheap to warrant salvaging second-hand material, and that we were probably making a lot of things that we had no business to make. Thereafter, when a building was torn down, little salvage was obtained from it. In this way, many thousands of dollars were wasted. I recall the retirement of a trestle containing several hundred thousand board feet of framed timber, all perfectly sound, from which less than 10 per cent of the material was salvaged.

More recently, some of these shops have been re-established and we are getting a large return from them. We find that we can resaw both bridge ties and other dimension material that is recovered from trestles and open-deck steel bridges, into smaller sizes that are being used in building repairs. Practically all of this material is creosoted, so that it must be used where it will not be exposed to view. Many of the ties are somewhat plate and spike cut and cannot be reused as they are, but by cutting off one end of the long steel-bridge ties and reducing the cross-sectional dimensions, we are able to reuse them to give us more service on branch line trestles.

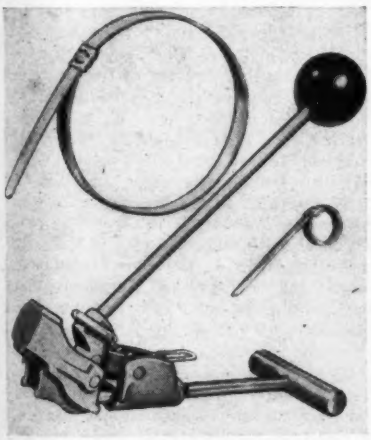
PRODUCTS of Manufacturers



Punch-Lok Hose Clamp

A CLAMP for connecting various kinds of male and female fittings, special nipples, menders or ordinary pipe to hose has been developed by the Punch-Lok Company, Chicago. All hose, including high pressure wire-woven and braided hose used in the control of hydraulic machines, such as coal excavators, road scrapers and snow plows, acetylene and pneumatic-tool hose, electric welding cable, sand blast hose, or any kind of flexible coupling between rigid pipe lines or fittings may be fitted with this clamp.

Punch-Lok hose clamps and fittings are said to make application possible without injury to the hose itself, and that, once the clamp has been locked, neither vibration nor rough handling can loosen it. In



The Punch-Lok Hose Clamps and the Loking Tool

making the connection, a high-tensile galvanized steel band is double-wrapped around the joint. After tensioning with a pull of 1,000 lb. within the Loking tool, the ends are securely locked together within the flat pressed-steel clip, without loss of tension and the excess band is cut off flush with the clip so that the entire joint of the clamps is streamlined for safety.

The Punch-Lok method of banding, clamping and splicing has been used for connecting high pressure hose, for splicing electric welded cable, stopping leaks in steam and water lines, reinforcing and mending splits in cross-arms and ladder rails, tieing rigid conduit or flexible cable to existing pipelines or girders, seizing ends of wire or manila rope to prevent fraying and many other jobs.

The No. 3 clamp with a ⅜-in. band width is designed for use with hose ranging from ¾-in. outside diameter to 3/16-in. inside diameter. Clamps for hose ranging from 1-in. to 48-in. inside diameter have a band width of ⅝-in. For electrical applications, such as line taps and ground clamps or for splicing flexible welding cable, where corrosion resistance is essential, Punch-Lok clamps may be obtained in Everdur, a copper base alloy. Clamps are available in preformed or open end types, the latter for lacing around the objects where end obstructions prevent use of a preformed clamp.

New Book

A. R. E. A. Proceedings

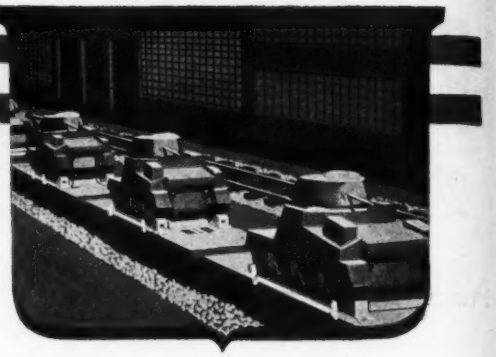
PROCEEDINGS of the American Railway Engineering Association for 1944. 771 pages, 6 in. by 9 in. Bound in cloth or half Morocco. Published by the Association, 59 East Van Buren street, Chicago. Price—cloth $8, half Morocco $9.

This volume contains the complete record of the year's work of this association, including the reports which its 28 standing and special committees presented at the 44th annual meeting in Chicago last March, together with the discussions that followed the presentation of these reports. Also included are addresses by J. M. Symes, vice-president, Western region, Pennsylvania, Chicago; by C. E. Smith, vice-president, New York, New Haven & Hartford, New Haven, Conn.; by Albert C. Mann, vice-president, purchases and stores, Illinois Central, Chicago; by H. L. Carter, director, Bureau of Employment and Claims, Railroad Retirement Board, Chicago; by T. A. Blair, assistant chief engineer system, Atchison, Topeka & Santa Fe, Chicago; by W. G. Powrie, engineer maintenance of way, Chicago, Milwaukee, St. Paul & Pacific, Chicago; by R. L. Groover, associate director ways and structures, Office of Defense Transportation, Washington, D.C.; by A. A. Miller, chief engineer maintenance of way and structures, Missouri Pacific, St. Louis, Mo.; by A. L. Sparks, architect, Missouri-Kansas-Texas Lines, St. Louis, Mo.; by A. B. Pierce, engineer water supply, Southern, Washington, D.C.; and by Lt. Col. Ralph E. Sherer, engineer maintenance officer, Military Railway Service.

As usual, the committee reports cover a wide range of subjects, providing valuable reference material on both railway maintenance and operation. Among the 114 subjects covered by the reports, for example, were the causes of shelly spots and head checks in rail; fire-resistant wood for railway buildings; the effect of high speeds on railway operating expenses; the economics of reduced rate of curvature on existing lines; welding of manganese castings in special trackwork; grades in hump classification yards; the cause and prevention of rail battering; direct locomotive coaling devices; sanding facilities for Diesel locomotives; labor economies derived from cleaning ballast; ballast specifications and tests; mowing machines; stresses in tie plates; number and placing of anti-creepers for various conditions; the use of asphalt in ballast; and chemical solution feeders for wayside water treatment.

Also included are monographs on Progress in the Study of the Relation of Track and Rolling Stock; on Studies of the Pressure as Affected by the Area of Contact Between Wheel and Rail; on Fatigue Failure in Its Relationship to the Strengthening and Repair of Steel Bridge Members; on An Investigation of Electrolytic Corrosion of Steel in Concrete; and on an Impact Investigation of a Plate Girder Bridge on the Pennsylvania at Elkton, Md. A considerable amount of valuable information is also contained in statistical data presented for the previous year on such important subjects as number and types of rail failures, crosstie renewals and crosstie service records.

NEWS of the Month



Maintenance of Way And Structures Expenditures

Expenditures for railway maintenance of way and structures in June, 1944, were $110,206,140—the highest of any June on record, and compared with $92,076,978 in June, 1943, a rise of $18,129,162, or 19.7 per cent. During the first six months of 1944, maintenance of way and structures expenditures were $604,310,272, the highest of any like period on record and a gain of $115,380,372, or 23.6 per cent, over the corresponding 1943 period's total of $488,929,898.

10,000 More Mexican Track Workers for U. S.

Under arrangements of the Mexican Government and the American Railroad Retirement Board, plans have been completed for bringing into the United States 10,000 more Mexican citizens to serve as track and maintenance of way employees on American railroads. The new arrivals will be assigned to 29 railroads and will not be permitted to engage in work other than on railroads. Each man will be employed under a six-month contract which, however, can be renewed at the end of that period.

Movement of Winter Wheat Reported Over "Hump"

The railroads are now "over the hump" in the movement of the current winter wheat harvest in the Southwest, and have already begun to send empty box cars into the Northwest in preparation for handling the anticipated huge spring grain crops, according to Warren C. Kendall, chairman of the Car Service Division of the Association of American Railroads.

In spite of serious handicaps, Mr. Kendall reported, "the railroads have met the demands of Southwestern grain shippers, and have provided all the transportation that the larger grain markets could absorb." He expressed confidence that the railroads will be able to do the same in the Northwestern area.

U. S. Railroad Timetable In France

Timetable No. 1 for the United States Army Military Railroad in Normandy was issued July 17, for Major General Frank S. Ross, Chief of Transportation, E. T. O., by Colonel Norman A. Ryan, Assistant Chief of Transportation, Military Railways Division.

The timetable, which took effect at "0001 double war time," Monday, July 17, 1944, lists scheduled trains and stations with mileage from station to station. Having been printed for the "information and government of military personnel," the table includes the following edifying footnotes: "Double track operation, normal current of traffic is to the right. Trains 1, 2, 3 and 4 will stop at all stations listed above. Eastward trains are superior to trains of the same class in the opposite direction."

Third Quarter Rail Allocations

The War Production Board has reduced the tonnage of new replacement rail available for domestic railroads during the third and fourth quarters of this year, according to a statement issued last month by the Office of Defense Transportation. Total new rail for domestic railroads during this year, however, is expected to reach about 1,800,000 tons, which, although below ODT's stated requirements, exceeds the 1943 total by 260,000 tons and represents a greater tonnage than was laid in renewal in any year since 1929. The new third-quarter allotment totals 400,000 tons; the original ODT request being for 550,000 tons. According to Col. J. Monroe Johnson, director of ODT, no decision has as yet been reached concerning the size of the fourth quarter allotment, although "all signs at present point to a quantity somewhat less than that of the third quarter."

July Employment Shows Slight Increase

Railroad employment decreased 0.29 per cent—from 1,446,860 to 1,442,623—during the one-month period from mid-June to mid-July, but the July total was 3.72 per cent above the comparable 1943 figure, according to the latest summary of preliminary reports prepared by the Interstate Commerce Commission's Bureau of Transport Economics and Statistics. The index number, based on the 1925-1929 average and adjusted for seasonal variation, was 138.4 for July as compared with June's 139.9 and July, 1943's 133.5.

Employment in July was greater than in June in four groups, but these increases of less than one per cent were more than offset by declines of 1.25 per cent in the maintenance of way and structures group, 0.37 per cent in maintenance of equipment and stores, and 0.36 per cent in train and engine service. Meanwhile, all groups were reported to be above July, 1943, the range being from 6.14 per cent for the maintenance of way and structures group to 0.75 per cent for train and engine service.

Railroads Can Handle More Westbound Traffic

Possible changes in the burden of traffic to be placed upon the railroads by the military services as a result of an early end of the European war and an intensification of the conflict in the Pacific were under discussion at the regular meeting in Washington, D.C., on July 28, of the board of directors of the Association of American Railroads. Col. J. Monroe Johnson, director of the Office of Defense Transportation, participated in the discussion, and he said, after the meeting, he had no doubt the railroads would be able to meet the situation.

If the feeling that now prevails in many quarters that Germany will soon collapse proves well founded, he observed, the railroads will face in the early future a large increase in westbound freight, but he expressed confidence that they would be able to accommodate themselves to the changed conditions in the same way that they have proved equal to each additional burden put upon them as war production has developed and overseas movements have expanded. At this time, he added, the railroads are handling with relative ease a traffic volume equal in ton-miles to the peak of last October, and it is still growing.

Admiral Praises Railroad Workers

A message of commendation from Rear Admiral W. B. Young, chief of the Bureau of Supplies and Accounts of the U. S. Navy, has been sent to American railroad employees and officers through the presidents or executive officers of the individual roads.

"The success of the Allied landings in western Europe—in fact, the success of every campaign undertaken by American ships and men in every war theater—has depended heavily upon the efficient transportation facilities which the railroads of

the United States have made available to the armed forces and to the war plants producing for them," Admiral Young said. "Materials must arrive at factories and shipyards on time if production schedules are to be met. Men and equipment must arrive at embarkation docks on time if invasion schedules are to be met. It is to the lasting credit of the men and women who staff and operate our railroads that they have never failed to meet these grave responsibilities. Every one of you may be proud of your individual part in helping the Navy to gain command of the seas and carry the fight relentlessly toward the inner citadels of the enemy."

47 Track Men Die in A. C. L. Wreck

Westbound Atlantic Coast Line passenger train No. 57, en route from Waycross, Ga., to Montgomery, Ala., and consisting of a steam locomotive and 14 cars, had its six rear cars derailed at Stockton, Ga., a station 42 miles west of Waycross, at 11:45 p.m. on August 4, when a rail broke under the train. The ninth car behind the engine, which was the sleeping car operating nightly from Savannah, Ga., to Montgomery, Ala., was the first car to be derailed, and was followed in leaving the tracks by a coach occupied by a number of colored track laborers (employees of the company), three unoccupied coaches which were deadheading to Bainbridge, Ga., for troop service, and a hospital car occupied by army personnel.

The coach occupied by the track laborers was thrown against the engine of an eastbound freight train waiting on the siding at Stockton for No. 57 to pass, and the coach was practically demolished, fatally injuring 47 and otherwise injuring 32 of the occupants of that car. The injured track laborers in the demolished coach were taken to hospitals at Valdosta, Ga., and Waycross, in ambulances and on a relief train which was sent out from Waycross.

The rail which broke under the train was of 100-lb. section, manufactured in 1927 and laid in the track in that year.

United States Ousts Jap-Americans From I. C.

Fifty-nine Japanese-Americans who were assigned to the Illinois Central by the War Relocation Authority for track work on its Chicago Terminal were withdrawn by the Authority on August 4 and reassigned to other employment in the Chicago area. The local of the Brotherhood of Maintenance of Way Employees had threatened to strike unless the Japanese-Americans were removed from the railway.

J. L. Beven, president of the railway, in a summary of the case, said:

"To meet a shortage of manpower, the War Relocation Authority assigned 59 Japanese-Americans to the Illinois Central for track work on the Chicago terminal. The Brotherhood of Maintenance of Way Employees objected, and the Army requested that the men be taken out of service for further check of their records. This was done, and the check-up is now being made."

Personal Mention

General

J. M. Rentfrow, roadmaster on the Denver & Rio Grande Western at Salt Lake City, Utah, has been promoted to assistant trainmaster, with the same headquarters.

W. C. Smith, chief engineer of the Detroit Terminal, with headquarters at Detroit, Mich., has been appointed acting general manager, with the same headquarters.

W. F. Koehn, assistant superintendent on the Laurentian division of the Canadian Pacific, and an engineer by training and experience, has been promoted to superintendent of that division, with headquarters as before at Montreal, Que. Mr. Koehn entered the service of the Canadian Pacific in 1916, in the maintenance of way department. In 1921 he was promoted to bridge and building master of the Montreal terminals, and in 1938 he was advanced to division engineer on the Laurentian division. In the same year Mr. Koehn was promoted to the position he held at the time of his new appointment.

Harland H. Best, superintendent of the Toledo, Peoria & Western, and a maintenance officer by training and experience, has been promoted to general manager, with headquarters at Peoria, Ill. Mr. Best was born at Williamsfield, Ill., on October 11, 1894, and entered railway service on June 16, 1909, in the bridge and building department of the T. P. & W. In 1917 he was granted a leave of absence to enter the U. S. Army and served 18 months in France with the A.E.F., returning to his position with the railroad in March, 1919. On January 9, 1922, Mr. Best was promoted to assistant master of bridges and buildings, with headquarters at Peoria, and on March 1, 1931, he was advanced to master of bridges and buildings, with the same headquarters. Six years later he was promoted to the position he held at the time of his new appointment.

Engineering

R. C. Davidson, roadmaster on the Canadian National, has been promoted to assistant division engineer on the Smithers division, with headquarters at Prince George, B.C., succeeding **B. E. Valde,** who has resigned.

R. A. Emerson, division engineer on the Canadian Pacific, with headquarters at Moose Jaw, Sask., has been promoted to assistant district engineer of the British Columbia district, with headquarters at Vancouver, B.C., succeeding **F. M. Rutter,** whose promotion to assistant to the general superintendent of that district, with headquarters at Vancouver, is reported elsewhere in these columns. **E. B. C. Macnabb,** roadmaster at Yorkton, Sask., has been advanced to division engineer, with headquarters at Moose Jaw, replacing Mr. Emerson.

R. D. Overholt, roadmaster on the Canadian Pacific, with headquarters at Lanigan, Sask., has been promoted to

R. D. Overholt

division engineer, with headquarters at Saskatoon, Sask., succeeding **C. A. Colpitts,** who has been transferred to Vancouver, B.C.

Mr. Overholt was born at Toronto, Ont., on January 12, 1904, and graduated from the University of Saskatchewan in 1927. He entered railway service in the same year as a transitman on the Canadian Pacific, with headquarters at Moose Jaw, Sask., and one year later he was transferred to Saskatoon, Sask. In 1940 Mr. Overholt was promoted to relieving roadmaster, with the same headquarters, and in 1941 he was advanced to the position he held at the time of his new appointment.

John W. Smith, whose promotion to assistant chief engineer of the Seaboard Air Line, with headquarters at Norfolk, Va., was reported in the July issue of *Railway Engineering and Maintenance,* was born

John Walter Smith

at Baltimore, Md., on July 20, 1900, and received his higher education at the University of Maryland. In 1924 he entered railway service with the Virginian as an engineer computer at Norfolk. Later in the same year he joined the Seaboard

Air Line as an engineer inspector at Columbia, S.C., returning in 1925 to the Virginian, in that position. Subsequently, he again went with the Seaboard Air Line as an engineer inspector, becoming successively assistant to the division engineer and assistant division engineer at Jacksonville, Fla., chief clerk to the engineer maintenance of way, at Savannah, Ga., and Norfolk, and assistant roadmaster at Richmond, Va. Mr. Smith was advanced to division engineer at Howells, Pa., in June, 1932, being transferred to Savannah the following year. In October, 1936, he became supervisor of the betterment and construction bureau at Norfolk, and in September, 1937, was appointed trainmaster. He was advanced to assistant superintendent in March, 1942, and to superintendent at Howells in September, 1942. He continued in that capacity until his new appointment.

Track

A. O. Johnson, track inspector on the Denver & Rio Grande Western, with headquarters at Pueblo, Colo., has been promoted to roadmaster, with headquarters at Walsenburg, Colo.

E. R. Moran, roadmaster on the Denver & Rio Grande Western, with headquarters at Gunnison, Colo., has been transferred to Alamosa, Colo. **J. F. Selby,** roadmaster at Walsenburg, Colo., has been transferred to Helper, Utah.

R. O. Renwick, relieving roadmaster on the Canadian Pacific, with headquarters at Moose Jaw, Sask., has been promoted to roadmaster at Rosetown, Sask., succeeding **B. L. Reid,** who has been transferred to Wadena, Sask. Mr. Reid replaced **F. W. Hooper,** who has been transferred to Nelson, B.C.

S. Zack, relieving roadmaster on the Saskatchewan district of the Canadian Pacific, has been advanced to roadmaster, with headquarters as before at Saskatoon, Sask., succeeding **E. B. C. Macnabb,** whose promotion to division engineer, with headquarters at Yorkton, Sask., is reported elsewhere in these columns. **H. J. Kennedy,** section foreman at Saskatoon, has been promoted to relieving roadmaster, replacing Mr. Zack.

A. L. King, track supervisor on the Gulf, Mobile & Ohio, with headquarters at Murphysboro, Ill., has been promoted to roadmaster, with the same headquarters, succeeding **J. T. Stallings,** who has retired after 45 years service.

Mr. Stallings was born on August 31, 1876, in Noxubee county, Miss. He entered the service of the Mobile & Ohio (now the G. M. & O.) in 1889, as a section laborer. He was section foreman and extra gang foreman from October 25, 1900, until August, 1920, when he was appointed wrecking foreman on the Mobile division. He was promoted to track supervisor on the Mobile district on February 11, 1922, and on July 15, 1929, he was advanced to the position he held at the time of his retirement.

M. T. Abrahamson, roadmaster on the Canadian National at Kamloops, B.C., has been transferred to Port Mann, B.C., succeeding **W. A. Eagleson,** who has retired after 43 years service. **J. A. Leslie,** roadmaster, with headquarters at Boston Bar, B.C., has been transferred to Kamloops, replacing Mr. Abrahamson.

Mr. Eagleson was born at Newmarket, Ont., and in 1901 entered railway service as a section laborer on the Grand Trunk Western (part of the Canadian National). Six years later he went with the Canadian Northern (now also a part of the Canadian National) as a section man, with headquarters at Indian Springs, Man. Later he served in that capacity at various other points on the road. In 1911 Mr. Eagleson was promoted to extra gang foreman, with headquarters at Edmonton, Alta., and in 1915 he was advanced to roadmaster at Lucerne, B.C. Four years later he was transferred to Port Mann, remaining in that location until his retirement.

Robert G. Wharton, whose promotion to track supervisor on the Gulf, Mobile & Ohio, with headquarters at Laurel, Miss., was reported in the June issue, was born at Bethel Springs, Tenn., on February 9, 1901, and entered railway service on January 5, 1922, as a track laborer on the G. M. & O., subsequently serving as assistant extra gang foreman, extra gang foreman and section foreman at various points on the line. In May, 1933, Mr. Wharton went with the Okolona, Houston & Calhoun City (abandoned in November, 1939) as superintendent, with headquarters at Houston, Miss. In 1938 Mr. Wharton returned to the G. M. & O. as a section foreman, and in April, 1943, he was promoted to assistant track supervisor, with headquarters at Tuscaloosa, Ala., the position he held at the time of his new appointment.

Bridge and Building

O. P. Shallenberger, office engineer on the Denver & Rio Grande Western, with headquarters at Pueblo, Colo., has been promoted to master carpenter, with headquarters at Alamosa, Colo.

Jesse A. Lewis, assistant supervisor of bridges and buildings on the Mohawk division of the New York Central, with headquarters at Utica, N.Y., has been promoted to supervisor of bridges and buildings of the St. Lawrence division, with headquarters at Watertown, N.Y., to succeed **L. W. Stone,** who has retired. **Clifford A. Bouton,** a bridge and building inspector on the Mohawk division, with headquarters at Albany, N.Y., has been promoted to assistant supervisor of bridges and buildings at Utica, to replace Mr. Lewis. **Howard J. Powell** has been appointed bridge and building inspector, with headquarters at Albany, to succeed Mr. Bouton. All these changes became effective on August 1.

Mr. Lewis was born on November 2, 1902, at Parish, N.Y., and entered railway service with the New York Central on April 9, 1923, as a carpenter helper, at Syracuse, N.Y. He became a carpenter at the same point on April 10, 1924, and was further promoted to assistant carpenter foreman at Syracuse on September 4, 1928. On May 10 of the following year, Mr. Lewis became carpenter foreman with the same headquarters, being advanced to bridge and building inspector at Syracuse on October 1, 1938. He was further promoted to assistant supervisor of bridges and buildings of the Mohawk division, with headquarters at Utica, on August 21, 1940, holding this position until his recent appointment as supervisor of bridges and buildings, effective September 1.

Mr. Stone is a native of Sterling, N.Y., and was born on July 14, 1874. He entered the service of the New York Central on February 20, 1898, as a carpenter on the St. Lawrence division, being advanced to carpenter foreman on the same division on April 1, 1903. Three years later Mr. Stone became general foreman on the St. Lawrence division, and on October 1, 1908, he was further advanced to bridge inspector on that division. After two years in the latter capacity he was promoted to supervisor of bridges and buildings, with headquarters at Oswego, N.Y., being transferred to the St. Lawrence division, with headquarters at Watertown, on July 1, 1930, remaining at the latter point until his retirement.

Water Service

W. R. Whitman, supervisor of water supply on the Chesapeake & Ohio, with headquarters at Huntington, W. Va., has been promoted to inspector of water supply, with the same headquarters, succeeding **C. E. Fisher,** who has resigned, effective September 1.

Obituary

E. R. Lewis, retired principal assistant engineer of the Michigan Central, with headquarters at Detroit, Mich., and managing editor of the 1921, first edition of the *Railway Engineering and Maintenance Cyclopedia* (then the Maintenance of Way Cyclopedia), published by the Simmons-Boardman Publishing Corporation, died on August 13 at St. Petersburg, Fla. He had retired from active service on December 1, 1939.

Buda Issues New Motor Folder.—A four-page folder, describing and illustrating the firm's F2 Model B "Roadmaster" motor car, has been published by the Buda Company, Harvey, Ill. In addition to a complete specification chart, the folder includes nine illustrations showing the motor car's construction features, each accompanied by descriptive text.

Folder Features Buda Demountable Wheels.—A new, four-page folder, featuring the Buda line of demountable motor car and trailer wheels, has been published by the Buda Company, Harvey, Ill. Several large illustrations show the method by which the wheels are applied or removed and are accompanied by a table of standard demountable wheel assemblies and tires.

(Continued on page 820)

The Test of Time

It takes time, understanding, and the *willingness to serve better* to establish a reputation . . . and it takes consistent performance on the job to justify that reputation.

Fairmont Railway Motor Cars have been seasoned by all of these elements. They represent the accumulation of more than 35 years of practical knowledge in the field of railway maintenance; of experience gained the hard way . . . teaching the need for simplified fundamental design, for inherent dependability to weather all conditions, for ruggedness to stand the gaff of tough service, for reserve power aplenty and for safety and comfort features to conserve energy and manpower.

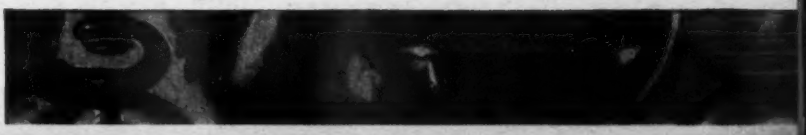
Standard Section Car S2 Series F (Illustrated at right) is an example of Fairmont knowledge and thinking. One man can handle this car, yet it will seat eight and haul two heavily loaded trailers. Powered by the Fairmont RQ Hy-Load Roller Bearing Engine (8-13 hp) this car will give matchless, economical service long after other cars have been scrapped.

Present day conditions require the efficiency and the utility of this car. Fairmount Railway Motors, Inc., Fairmount, Minn.

Performance ON THE JOB COUNTS

Of All the Cars in Service Today
MORE THAN HALF ARE FAIRMONTS

Fairmont Railway Motor Cars



Association News

Maintenance of Way Club of Chicago

Preliminary plans for the 1944-45 session of the club are well advanced and work is under way on the publication of the club's Year Book, which it is expected will be made available to members early in October.

Bridge and Building Association

At a meeting of the Executive committee in Chicago on August 21, the association cancelled its plans for an annual meeting in Chicago on October 17-19. However, in order to review and pass upon the technical reports of its committees for the current year and to make plans which will permit carrying forward work of the association in the year ahead, it will hold a one-day business meeting of its Executive committee in Chicago, at the Hotel Stevens, on October 18. Invitations to attend this meeting will be extended to the chairmen and members of all technical committees and to other members and interested railroad men in the Chicago area. Preprints of all technical reports will be made available by *Railway Engineering and Maintenance* to those attending the Executive meeting, and the approved reports will be reprinted from the pages of the November issue of *Railway Engineering and Maintenance* and sent to all members.

Roadmasters' Association

At a meeting in Chicago on August 14, the Executive committee voted to cancel the previously scheduled annual meeting of the association at the Hotel Stevens, Chicago, on September 19-21, this action being taken to co-operate with the Office of Defense Transportation, which has been discouraging large group meetings of any kind to lessen the travel burden on the railways. Instead of the three-day annual meeting, the association will hold a one-day business meeting in Chicago of its Executive committee, the chairmen and members of its technical committees, and such other members and other railroad men in the Chicago area who may find it possible to attend without train travel. This meeting, which will be held on September 20 at the Hotel Stevens, will receive and act upon the current reports of all technical committees and will organize the work of the association for the ensuing year.

For the convenience of those attending the meeting on September 20, *Railway Engineering and Maintenance* will make available preprinted copies of all committee reports, and will subsequently present the approved reports in its October issue, copies of which will be sent to all members of the association.

The reports to be considered at the coming meeting are as follows: Operation and Maintenance of Work Equipment; Effect of Traffic on the Service Life of Ties and Methods of Protection; Prevention of Accidents to Trackmen; Mechanization of Section Gangs; What the Trackman Can Do to Speed up Train Operation; and Recruiting Men in the Face of a Labor Shortage.

American Railway Engineering Association

Five committees of the association plan meetings during September, three of them being scheduled in Chicago at the time of the one-day Executive business meeting of the Roadmasters' Association, which, as noted elsewhere in these columns, will be held in Chicago on September 20. The committees which will hold meetings in September include Roadway, which will meet in Chicago on September 19 and 20; Economics of Railway Labor, which will meet in Chicago on September 20; Track, which will meet in Chicago on September 21; Yards and Terminals, which will meet in Cleveland, Ohio on September 21; and Economics of Railway Location and Operation, which will meet in Chicago on September 26 and 27. Only one standing committee met during August, that being the Committee on Buildings, which held its meeting in Chicago on August 29 and 30.

At a meeting in Chicago on August 8, the Board of Direction reviewed the requests of the various association committees for funds for research work during 1945 and referred these requests to the General committee of the Engineering division of the Association of American Railroads.

The 1944 Proceedings, reporting the activities of the association for the year ending with the annual meeting last March, were sent to members during the month. The Annual Supplement to the Manual was also sent to members during August. Late in September, it is expected that the September-October Bulletin will be ready for mailing (plans for this Bulletin calling for 316 pages of text and illustrations) to be devoted exclusively to a report on the Counterbalance Investigation being conducted jointly by the Engineering and Mechanical divisions.

Wood-Preservers' Association

At a meeting of the Executive committee in Chicago on July 12, consideration was given to the organization of technical committees for the ensuing year and the following chairmen were chosen: Promotion and Education, H. R. Condon, vice-president, Wood Preserving Division, Koppers Company, Pittsburgh, Pa.; Preservatives, R. H. Baechler, chemist, Forest Products Laboratory, Madison, Wis.; Pressure Treatment of Oak Ties and Lumber, P. D. Brentlinger, resident inspector, Forest Products, Pennsylvania, Philadelphia, Pa.; Pressure Treatment of Southern Pine Ties and Lumber, E. H. Moore, gen. supt., International Creosoting & Construction Co., Texarkana, Tex.; Pressure Treatment of Gum Ties and Lumber, J. E. Mausteller, chief tie and timber inspector, Seaboard, Jacksonville, Fla.; Pressure Treatment of Poles, W. R. Yeager, inspection engineer, Western Electric Co., Inc., New York; Non-Pressure Treatment of Poles, J. P. Wentling, wood technologist, Consolidated Treating Co., Minneapolis, Minn.; Inspection, H. F. Round, Pennsylvania, Philadelphia, Pa.; Tie Service Records, W. J. Burton, asst. to ch. engr., Missouri Pacific, St. Louis, Mo.; Bridge and Structural Timber, T. H. Strate, div. engr., C. M. St. P. & P., Chicago; Marine Pile Service Records, A. S. Daniels, supt. treating plant, Texas & New Orleans, Houston, Tex.; Pole Service Records, C. H. Amadon, engr., Bell Telephone Laboratories, Inc., New York; Pressure Treatment of Intermountain Fir and Western Hemlock, J. M. Gurd, supt., Timber Preservers Ltd., B. C., Canada; Post Service Records, J. O. Blew, Jr., Forest Products Laboratory, Madison, Wis.; Diversified Uses of Treated Wood, Leonard Perez, dis. sales manager, Wood Preserving Division, Koppers Company, St. Louis, Mo.; Use of Treated Wood for Car Lumber, H. R. Condon, vice-pres., Wood Preserving Division, Koppers Co., Pittsburgh, Pa.; Pressure Treated Foundation Piles, W. A. Stacey, engr., Service Bureau, Wood-Preservers' Association, Lawrence, Kan.; Fireproofing, R. H. Mann, engr., Service Bureau, American Wood-Preservers' Association, New York; Co-ordination and Standardization of Treatment Specifications, John Foley, ch., Lumber section, Purchases division, War Production Board, Washington, D. C.; Treated Wood Blocks, A. W. Cobley, president, Hicks-Cobley, Inc., Toledo, Ohio; Painting of Creosoted Wood, J. G. Segelken, engr., Bell Telephone Laboratories, Inc., New York; and Preservative and Fire Retardant Treatments of Laminated Members (Plywood and Glued-Up Fabrication), D. L. Lindsley, J. H. Baxter & Co., Los Angeles, Calif.

Supply Trade News

General

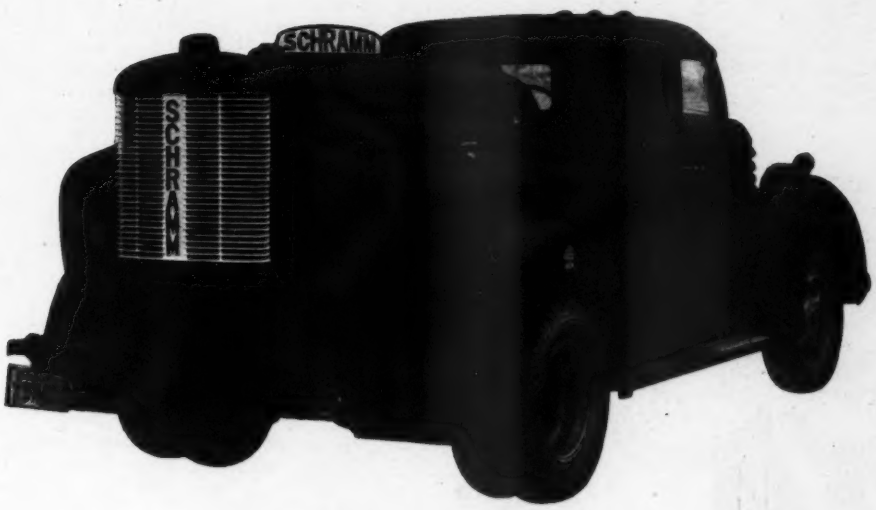
In the future, the **Kalamazoo Railway Supply Company** will operate under the name of the **Kalamazoo Manufacturing Company.** This change was made because the former name caused some confusion as to the actual nature of the business. The company manufactures its own products and does not act as a supplier. The company will continue to furnish the same products as in the past and will operate under the same management according to the announcement of the change of name.

Personal

Howard P. DeVilbiss, vice-president, has been elected president and general manager of the **DeVilbiss Company,** Toledo, Ohio, to succeed **Allen D. Gutchess,** who has been elected chairman of the board and active senior executive. Mr. Gutchess succeeds **W. M. Booker,** who will continue as a member of the board. **Frank A. Bailey,** vice-president and general manager, who has been with the company for 34 years, has retired. **Don J. Peeps,** of the engineering staff, has been appointed acting chief engineer.

Adam J. Hazlett, general manager of sales, has been elected vice-president in charge of sales of the **Jones & Laughlin**

(Continued on page 822)



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DURABILITY?

A big point. Schramm Air Compressors are rugged ... suitable alike for rough, rocky travel and for soft muddy places ... withstand wear and tear.

VERSATILITY?

Versatile—yes! Power and Engineering Companies use Schramm for laying conduits and cables ... digging post-holes ... operating pneumatic drills and hammers ... breaking pavements ... supplying hoist, lifts, jacks ... cleaning engines and machines by jets ... plus many more uses.

COOLING SYSTEM?

Ah, there's a feature! 100% watercooled, Schramm Compressors prevent overheating in summer, freezing in winter ... enabling them to work with doors closed (thus keeping out dust).

Schramm Air Compressors—both portable and stationary—are extensively used in general field service, generating stations, steam plants, repair shops.

Outstanding features responsible for this widespread use are: completely watercooled ... mechanical cam-operated intake valves ... larger discharge in head ... forced feed lubrication, to every moving part, through oil lines drilled in metal ... main bearings for each cylinder ... vibrationless ... safe, fast starting by push button ... compact and lightweight!

Get air when you want it by using a Schramm. For further details write for Booklet Pub-44.

SCHRAMM INC.

THE COMPRESSOR PEOPLE
WEST CHESTER
PENNSYLVANIA

Steel Corporation, to succeed **Lewis M. Parsons,** who has resigned. **L. T. Willison** has been appointed manager of cold finished sales in addition to his duties as manager of ordnance sales for the company.

George J. Diver has been appointed vice-president of **Morrison Metalweld Process, Inc.,** subsidiary of the Morrison Railway Supply Corporation. Mr. Diver

George J. Diver

began his career in the superintendent's office of the Peoria & Eastern in 1900. He subsequently was employed with the Big Four and with the Lake Erie & Western, where he was freight claim investigator. He joined the Interstate Car Company of Indianapolis, Ind., in 1905 and served as general manager from 1919 to 1924. When the Interstate Car & Foundry Co. was organized in 1925, he was elected president and general manager. He joined Morrison Metalweld Process in 1929, handling sales and operations in the western district. He was transferred to Buffalo, N. Y., in a similar capacity in April, 1941.

H. G. Mastin, service engineer of the **Dearborn Chemical Company,** Chicago, has been promoted to district sales manager of the Eastern district of the Rail-

H. G. Mastin

road department, with headquarters at New York. He entered railway service with the New York, Ontario & Western where, during 11 years of service, he advanced from locomotive fireman to traveling fireman and to assistant road foreman of engines. Following that he was employed for 10 years by the Locomotive Stoker Company, six years as service engineer and four years as sales representative. For the next 5½ years he was employed in the railroad and marine departments of the Pantasote Company, and for the following six years he was a sales representative in the Locomotive Equipment division of Manning, Maxwell & Moore. He entered the employ of the Dearborn Chemical Company on April 15, 1942 as a service engineer, which position he has held until his recent promotion.

Raymond P. Townsend, sales manager, Eastern region, Transportation department of the **Johns-Manville Sales Corporation,** has been appointed general sales

Raymond P. Townsend

manager of the transportation department throughout the United States and Canada, with headquarters at New York. **John D.**

John D. Johnson

Johnson, divisional sales manager of the Transportation department, Eastern division, has been promoted to sales manager, Eastern region, Transportation department, also with headquarters at New York. Mr. Townsend began his career in the purchasing department of the New York Central, later serving as purchasing agent of the Liberty Steel Products Company and as railroad sales representative of the Murphy Varnish Company. He joined Johns-Manville in March, 1925.

Mr. Johnson began his career in railroad servicing work in the mechanical departments of the New York Central, the Missouri Pacific and the Baltimore & Ohio, from 1907 to 1919. He joined Johns-Manville as a salesman in 1920 and was appointed division sales manager of the central division at Cleveland, Ohio, in 1930. He was appointed acting sales manager of the eastern division, with headquarters at New York, in 1943.

R. S. Manley, president of the **Texas Creosoting Company,** with headquarters at Orange, Tex., has been elected chairman of the board of the company, with the same headquarters. **Howard S. Peterson,** vice-president of the company at Orange, has been elected president, succeeding Mr. Manley.

Obituary

Harry Scott Wherrett, chairman of the board of the Pittsburgh Plate Glass Company, died on August 13 following a brief illness.

Frank C. Worthington, who retired as vice-president of the Western Wheeled Scraper Company, Aurora, Ill., in 1934, died in that city on August 6.

Argyle Campbell, president of the Enterprise Railway Equipment Company, Chicago, died at San Clemente, Cal., on August 12.

John P. Moses, formerly manager of railroad sales for Joseph T. Ryerson & Son, Inc., Chicago, died in a hospital in that city on August 18, following a long illness.

Edward Olriksen, manager of the general materials and equipment department of the Robert W. Hunt Company, with headquarters at Chicago, died in that city on July 28.

Stonhard Concretite Folder.—The Stonhard Company, Philadelphia, Pa., has published a four-page folder featuring its Stonhard Concretite, a building material which is described as a liquid which is mixed with cement, sand and water to produce a quick-setting floor. The folder is printed in color and contains a number of photographs of newly-installed floors.

Booklet Tells Railroad Uses of Manganese Steel.—A new 38-page booklet which describes the advantages of manganese steel in numerous and diversified uses in the Railroad industry has been published for distribution among railroad executives by the American Manganese Steel division of the American Brake Shoe Company, Chicago Heights, Ill. Designated as Bulletin 943-R, the booklet describes and illustrates car and locomotive wearing parts and also presents tests to demonstrate that longer life, greater resistance to wear and easier maintenance result from the use of manganese steel.

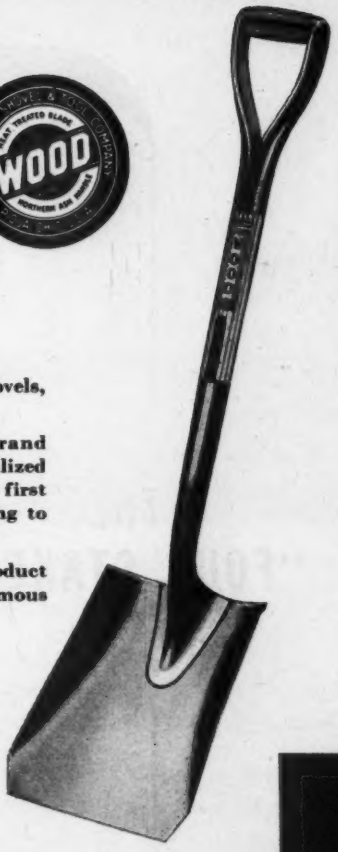
WOOD Specialization

ASSURES MORE STRENGTH in the HANDLE

For over 40 years, WOOD has specialized in making only shovels, spades and scoops of finest quality.

The sturdiness, strength and durability of WOOD Brand Track Shovel Handles is a natural result of WOOD Specialized Manufacturing. These handles are made only of finest, first quality woods, constantly tested throughout manufacturing to assure perfect uniformity in their strength and perfection.

Product Leadership springs from Specialization . . . and product leadership is shown in every construction detail of this famous railroad track shovel.



The WOOD Closed Back Track Shovel . . . with Steel I-Beam Handle Reinforcement.

THE FIRST WORD IN CONSTRUCTION
THE LAST WORD IN WEAR

THE STEEL I-BEAM
HANDLE REINFORCEMENT
. . . a result of WOOD SPECIALIZATION . . . found exclusively in products made by Wood. Adds 30% —and more—STRENGTH where 65% of breaks occur.

INDUSTRY'S "FOUR STAKES" IN THE WASTE PAPER SALVAGE PROGRAM

THE "FOUR STAKES"

STAKE NO. 1

Waste paper provided by industry is an essential raw ingredient in the manufacture of paper and paperboard products necessary for military and essential civilian uses.

STAKE NO. 2

Waste paper is essential to make the containers that help keep your business alive by distributing the products you make.

STAKE NO. 3

Waste paper in most industrial plants can be sold to waste paper dealers. It is a source of extra profit to your company.

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Waste paper in the form of old files, obsolete records, loose paper around warehouses, receiving departments and shipping departments takes up space that costs money and slows down efficiency.

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Fairmont Light Section Car equipped with Timken Bearings on all axles. Manufactured by Fairmont Railway Motors, Inc., Fairmont, Minnesota.

High availability is an important characteristic of Timken Bearing Equipped section cars — just as it is of main line equipment — locomotives, cars and streamlined trains.

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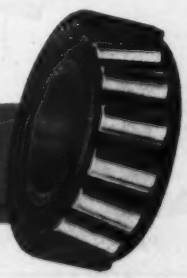
TAPERED ROLLER BEARINGS



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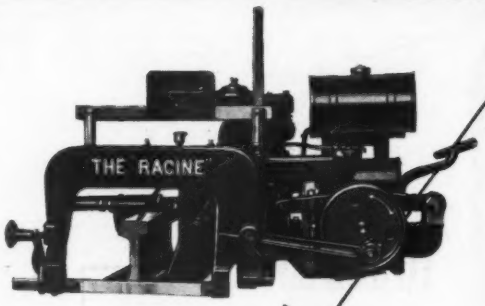

Cut Rail . . . fast, smooth, accurately

With RACINE PORTABLE RAIL CUTTERS

The Racine Rail Cutter is easily carried from one rail end to another. Two men carry it. One man can operate it.

Use this modern, portable tool for rail cropping on switches, curves, interlockings and crossings. It is equally practical for cropping rail ends at the pile in your yards. Wherever it is used your rail ends are cut fast, smooth and accurately. No damage to grain structure to cause rail failure.

These Racine Machines come equipped with gasoline engine, electric or air motor drive. Get complete information, ask for Catalog No. 58-A. Write Dept. RE-S.

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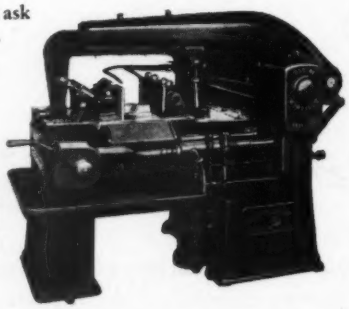

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We also design and build special machines for special and unusual metal cutting operations. Write us about your needs.

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Getting right down to facts, you can't count a farm's yield by its acreage; a factory's output by its floor area, nor a water system's gallon capacity by its well diameter. It's the "pay off" in each that really counts.

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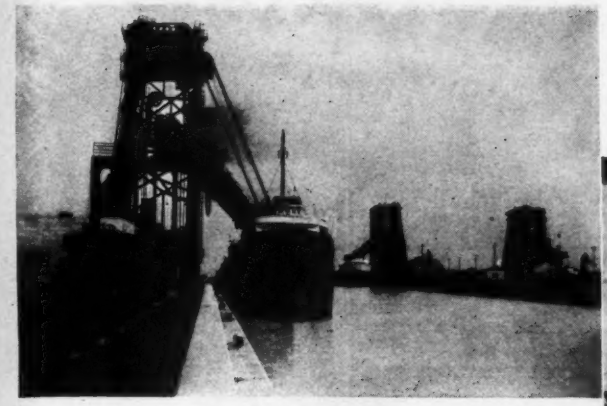
BUILDERS OF WELL WATER SYSTEMS FOR EVERY INDUSTRIAL AND MUNICIPAL NEED

Industrial Brownhoist Material Handling Equipment



Industrial Brownhoist manufactures equipment for handling all types of materials. Whether you need small clamshell buckets or the largest coal and ore bridges, Industrial Brownhoist will design and build standard or special equipment to do the job with the greatest speed and efficiency.

Above: Three Industrial Brownhoist high-lift electric car dumpers, capable of handling sixty cars per hour, each car carrying up to 120 tons of coal. Right: A typical Industrial Brownhoist gasoline or diesel locomotive crane for use with magnet, hook or bucket. Patented Monitor-type cab allows 360° visibility and increases operator efficiency.

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FOR PORTABLE POWER WHEN AND WHERE YOU NEED IT . . .

for all power or lighting requirements from ½ KVA to 17 KVA . . . AC or DC . . .

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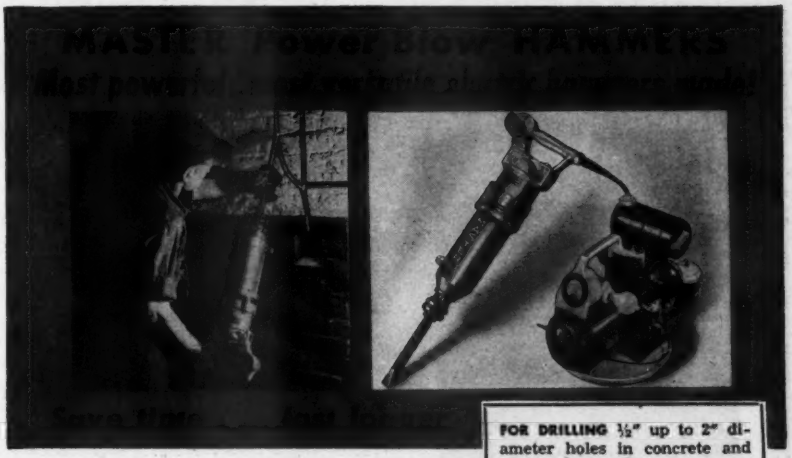
Save time . . . save money . . . speed work!

Master Vibrator Company provides compact, portable gas-electric generator plants in eleven basic sizes from 500 watts to 17,660 watts and thirty different types to meet all AC or DC power or lighting requirements. Housed or open models . . . available with wheelbarrow, buggy or trailer mounting. For operating a single tool or motor or floodlight . . . or operating gangs of tools, groups of motors or lighting entire areas. Easy to put into operation . . . economical to operate and maintain. It will pay you to get complete illustrated details and specifications . . . **write Department of Information, Master Vibrator Company, Dayton 1, Ohio, and ask for Bulletin 594.**



Available with tools for drilling, cutting or spading. Will do light duty work or any heavy duty work. The Master Hammer runs without striking a blow until pressure is applied, enabling operator to control blow as job requires. Easy and economical to operate. Built for light weight and long service. Used throughout the world. Power blow hammers operate on 115 volt AC or DC, 25, 50, or 60 cycle. If no electricity is available use Master Portable Generator Plant Model 650 (illustrated above).

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FOR DRILLING ½" up to 2" diameter holes in concrete and other hard materials.

FOR CUTTING concrete and other materials. For vibrating, tamping, chipping steel, cast iron and wood . . . scaling and caulking . . . peening welds and other heavy work.

FOR SPADING, cutting clay and similar materials.

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SUPER-FINISHED CRANKSHAFTS

another "PLUS FEATURE" IN ALL WISCONSIN Air-Cooled ENGINES

The very ingenious, specially designed machine illustrated above, puts a mirror-smooth *superfinish* on the crank-pins of all Wisconsin Air-Cooled Engines. By combining perfectly synchronized rotating and oscillating polishing movements, absolutely uniform diameter is maintained over the full length of the crankshaft bearing surfaces.

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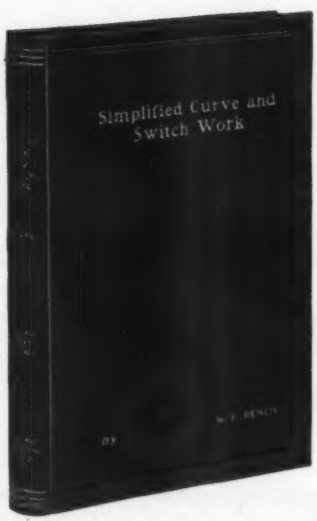
Simplified Curve and Switch Work

By W. F. RENCH

Formerly Supervisor, Pennsylvania Railroad



This little book has practically revolutionized curve and switch calculation practice since its appearance 25 years ago. The proved accuracy of its methods has caused them to be adopted as standard practice on many roads.

Complex algebraic and geometric calculations are reduced to their simplest form and as nearly as possible to terms of simple arithmetic. The application of these calculations to the actual job is made plain by brief explanations.

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Curves: The Relining of Curves with a String—Preliminary Study of the Curve—The Solution of String Lining Problems—Super-elevation of Curves—The Spiral—The Vertical Curve—Economics of Curves—Practical Switch Connections: Essential Elements in the Design of Switch Connections—Rules for Computing Switch Dimensions—Rules for Various Functions of Turnouts—Practical Considerations in Installing Turnouts—Methods in Installing and Maintaining Switches—Siding Location: Simplified Field Work—Special Practices.

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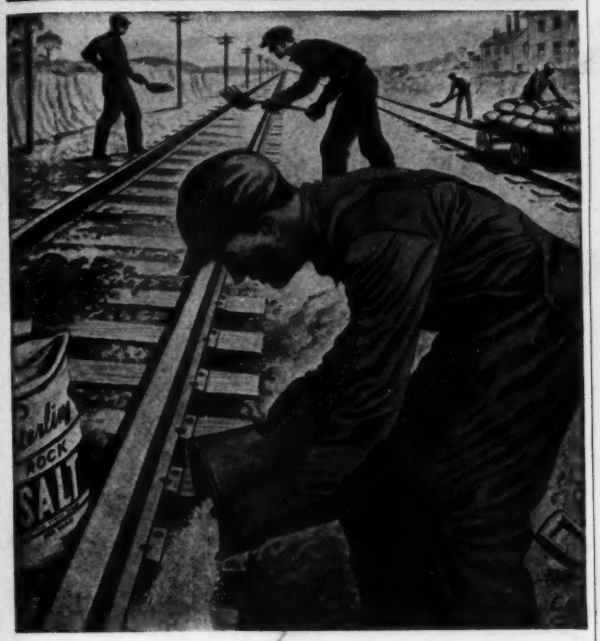

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The shimming and re-shimming of track to compensate for frost heaves and the gradual removal of shims as the roadbed thaws are costly operations that waste precious man-power needed for dozens of other maintenance jobs.

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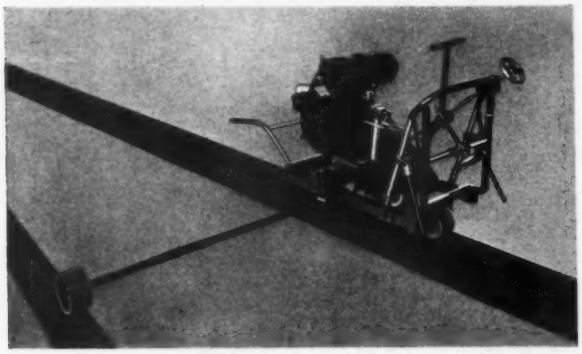

Model P-16 Railway Track-work Grinder—one of many models.

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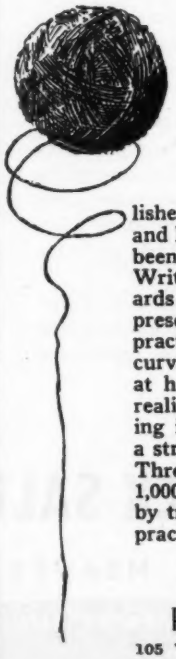

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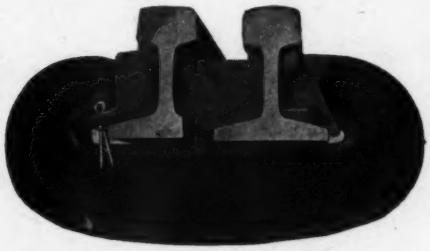

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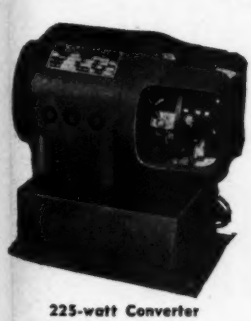

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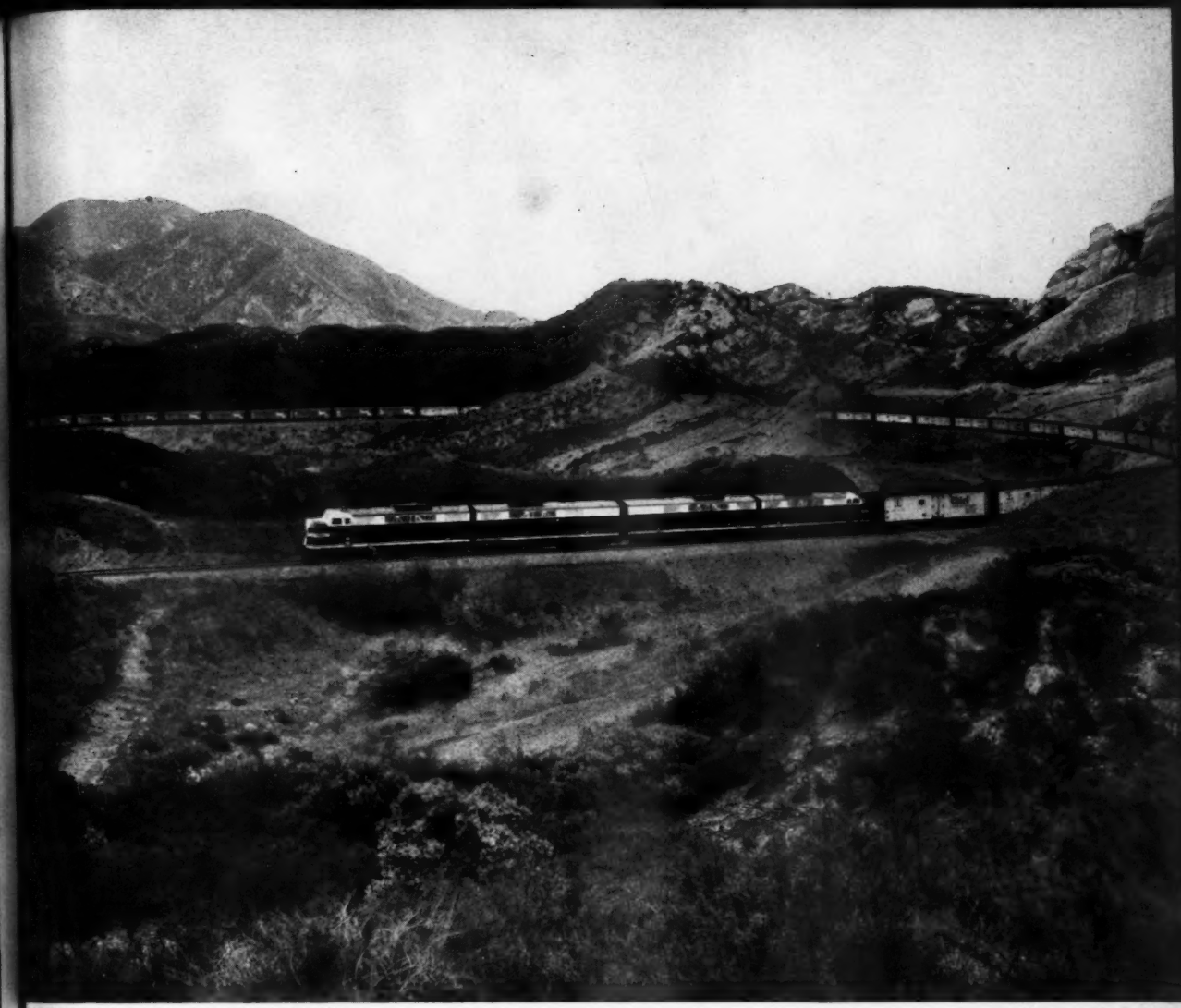

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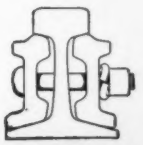
IMPROVED HIPOWERS

IMPROVE TRACK

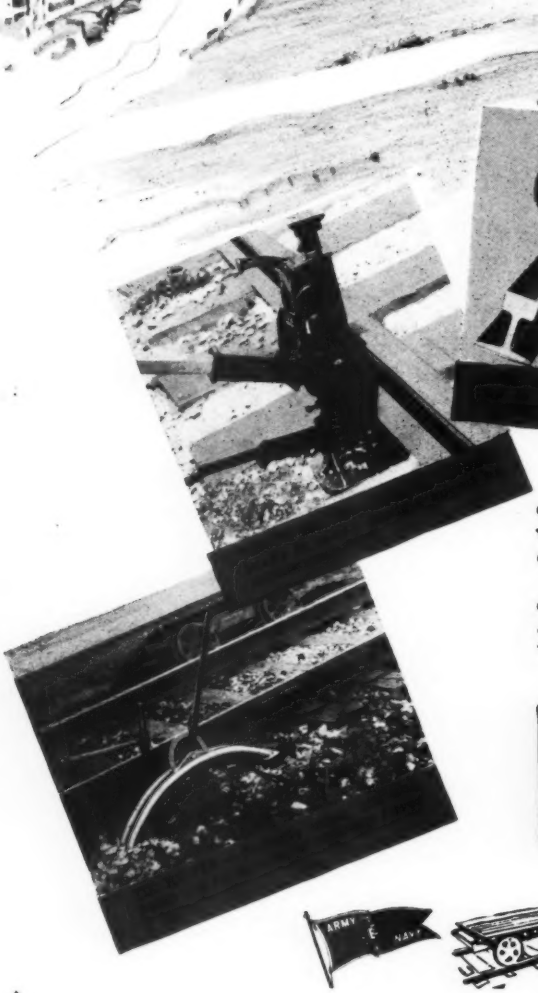


In these days, when railway track is being subjected to the heaviest traffic in history Improved Hipowers are more important than ever in maintaining initial bolt tensions, assuring resilience of joints and protecting rail ends.

THE NATIONAL LOCK WASHER COMPANY, NEWARK, N. J., U. S. A.

A COMPLETE LINE OF RAILWAY SPRING WASHERS

No Sundays on the railroad



Every day of the week, every hour of the day, around the clock, trains keep rolling along. This would be impossible but for the conscientious work of maintenance-of-way crews.

In over 63 years BUDA has not slackened its efforts to increase the efficiency of the maintenance-of-way equipment manufactured for the men that keep 'em rolling. For peak performance specify BUDA. Write or Wire for bulletins.

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